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LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

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Editorial Notes.

The Visit to Berlin.

We venture to speak not only for those who, last week, were visitors to Berlin, but also for the whole British gas industry, when we express through these columns sincerest thanks to the German Gas and Water Association. The party who made the journey were officially representative of the Institution. We were privileged to accompany the party and to see the reception accorded by their German confrères, which would have been enough to justify this expression of gratitude, even without hearing on every side the very real approbation of the English visitors. More could not possibly have been done to make them welcome. No trouble, no expense was spared; and the result was not only a highly interesting, but also an extremely entertaining, sojourn, which to most seemed far too short. Not only from those with whom we have the common bond of gas, but indeed from every side, there was the same welcome for the Britisher. It is true that there is not always an exhibition to serve as an extra incentive, but it is a pity that visits like this cannot be arranged more frequently. There is always something to see in what others are doing; always something to be gained by an interchange of ideas. Above all, perhaps, there is the intangible benefit of a widened outlook obtained by personal contact with another people; a something which, though difficult to define, was appreciated by those who made the trip. There can be no question that every effort must be made to attract a return visit by members of the German Association at the earliest opportunity; those who have just been to Berlin will take the greatest pleasure in helping to welcome any German deputation that may come.

Of the Exhibition little can be said except in superlatives. It was generally acclaimed as the "finest ever." The Germans have always been accustomed to award the palm for gas propaganda to this country and the United States, while depreciating their own efforts in this direction. But, apart from the manner in which everything is displayed, the propaganda material is in many respects original and clever, and was found to be of great interest by those whose business it is to develop sales by such means. The manufacturing plant is chiefly remarkable for the scale upon which it is exhibited; pride of place being taken, perhaps, by the refractories section. As at Munich in 1914, some of the visitors still acclaimed the domestic appliances—especially cookers—as ahead of our own. Generally of lighter build, they are extremely attractive in appearance, and undoubtedly efficient.

We cannot conclude this note in any better way than by calling attention to the fact that the Exhibition has still more than a month to run. There is plenty of time between now and July 21 for those who have not seen it to do so. If they have any qualms about their German, they can rest assured that every other German in Berlin speaks English. If they dislike the idea of being strangers in a strange land, the "JOURNAL" will be delighted to put them in touch with natives from whom they will be assured of a hearty welcome and expert guidance.

Modern Coking Plants in Germany.

In our columns to-day is published an article which may with all due discretion be termed romantic, and its perusal must stir the enthusiasm of all imaginative engineers. It describes briefly some of the characteristic features of modern coking plants in the Ruhr Coalfield, regarding which it is claimed that, "as regards capacity, the combining of utility with architectural beauty, and the technical innovations embodied in them, they surpass even the large centralized plants erected in the United States during the war." Engineers will doubtless endorse these claims, though we are sceptical whether the general public will appreciate the "architectural beauty" of the coking coal towers, which hold from 4000 to 5000 tons of fines, and rise to heights of 130 to 165 ft. above the ground. Two sentences epitomize the development which has taken place during the past three years: In 1926 there were in the Ruhr Coalfield 140 coking plants operating 16,200 ovens capable of producing 28 millions of coke per annum. There are at the present time 36 large coking plants comprising 7000 ovens with a yearly output of 25 million tons of coke.

The article to which we refer explains how this remarkable change in technique has been effected. The oven chambers have been increased in length to 40 ft. and more, and practically half the new ovens are over 13 ft. in height—some are actually nearly 20 ft. high. Regarding the technical innovations, attention may be called to the facts that in certain instances the coal bunkers and mixers have been lined with glass plates, to allow of freer travel of the coal; to the arrangements made for the speedy discharge of the 60-ton filling trucks, which impose a weight of about 85 tons on the roof of the oven; to the adoption of the portal type of pusher, which weighs as much as 150 tons; and to the universal employment of wet quenching, the refinements of which, however, ensure that the finished coke shall contain not more than 2 p.ct. of water. Though the dry method, with its attendant economic advantages, has not made much headway, it is significant that practically every plant is equipped so that this system can be introduced later if necessary.

Mention must be made of two further interesting points—the elimination of naphthalene and a novel method of steam raising. Regarding the former, in one method the

naphthalene is trapped by washing the gas with the condensate liberated by the volatile ammonia bases, while in another system the gas is washed with the condensate cooled nearly to zero by the Linde process. The steam-raising device, which is illustrated in the article, consists of water-cooled risers (ascension pipes); and it is estimated that this arrangement enables about 260 lbs. of steam at a pressure of approximately 114 lbs. per sq. in. to be generated from each ton of coke. In designing the new plants, careful attention has been given to the question of having gas available for long-distance supply; and most of the ovens are of the compound type arranged for heating with low-grade gas. In some installations the latter is generated from breeze in special producers. A table is included which gives interesting figures of the cost of several typical coking plants; and the capital cost of a plant for producing 1¼ million tons of coke per annum is stated to be approximately 17s. per ton of coke made.

Explosions and Bursts in Mains.

CERTAIN recent occurrences led to the appointment of a Special Burst Mains Committee of the Surveyors' Institution to consider and report upon explosions and bursts in mains under roadways, and to suggest protective or preventive measures. The report of this Committee, which was under the Chairmanship of Mr. E. J. Silcock, has now been received and adopted by the Council of that Institution; and it explains that the Committee met on various occasions, and examined the evidence given at the Home Office Commission of Inquiry into the Bloomsbury explosion. They also obtained statistical and other information with regard to explosions or bursts that have taken place under different classes of roads.

Admittedly, modern conditions have resulted in fresh problems. The introduction of mechanically propelled vehicles has brought in its train the necessity for altered methods of road construction; while another sign of the times is the fact that the presence of petrol vapour in sewers has in some instances been the cause of explosions. It is, however, satisfactory to learn that reports received from a number of surveyors and engineers to local authorities point to the conclusion that the recent series of bursts and explosions has been due either to coincidence or to somewhat abnormal circumstances. Their experience shows that the frequency of these accidents is no greater now than formerly. We agree that this would be insufficient reason for not suggesting protective measures or endeavouring to improve upon existing conditions; but it is a finding which might well be impressed upon certain sections of the newspaper press.

The opinion is expressed that additional powers are required by local authorities to control the laying by undertakers within their areas of all underground mains and conduits; and there is some criticism of the quality of the material and the jointing sometimes employed for mains and pipes. The Committee regard improvement in manufacture and the imposition of stringent chemical and mechanical tests as essential to ensure proper resistance to the stresses suffered under present conditions. In so far as the charge of using indifferent and untested materials relates to gas mains—and the Committee say "particularly in the case of some gas mains"—this is not easy to understand, seeing that (apart from all considerations of danger) a small percentage of leakage is of prime importance to the undertaking. In their own interests, only the best materials and workmanship should be employed; and we are confident that in the vast majority of cases this is done. However, note may be taken of the Committee's suggestion that in this connection the advantages of standardization as carried out by the British Engineering Standards Association will be recognized, and should be extended to include chemical tests.

In one of their recommendations, the Committee have been forestalled—namely, that some provision (admittedly a problem of difficulty) for the adequate ventilation of the sub-soil should be devised to compensate for the loss of ventilation due to the impervious nature of many road surfaces. In the "JOURNAL" for May 1 last (p. 276) there will be found an illustrated description of the Donkin "Sub-Soil" Vent Box, which has been designed with the threefold object of providing ventilation of the sub-soil to any depth beneath the impervious surface of roads and footpaths, of minimizing the possibility of dangerous explosive mixtures accumulating under road surfaces, and of serving as an indication of the position of gas mains. It provides a vent by which escaping gas is conveyed harmlessly into the atmosphere above the road surface. The Committee are in full agreement with the recommendations of the Home Office Commissioners already referred to in favour of co-ordination in the control of underground services, and of the adequate ventilation or filling-in of any structure forming an underground cavity of any considerable size. The recommendations of the Committee are set out elsewhere in this issue.

Second World Power Conference.

ARRANGEMENTS are now well in hand for the Second World Power Conference, which is to be held in Berlin from June 16 to 25 next year; and the Organizers—the German National Committee—have already sent to each of the forty-seven member countries suggestions for the preparation of papers to be presented. Following the plan adopted in connection with the sectional meeting on fuel problems staged in London last year (the newly-published "Transactions" of which were reviewed in the "JOURNAL" a fortnight ago), the papers will not be read at the Conference, and the German Committee are appointing General Reporters for every section of the programme. The Reporters will prepare summaries of the papers and indicate for discussion the subjects they deem to be of general interest. Independent, however, of the classes and divisions of the technical programme, three or four papers will be read by outstanding international and industrial representatives before all members of the Conference. In these papers the whole field of power generation and utilization will be reviewed.

The contributions will be divided into four main classes: Sources of power; production, transmission, and storage; utilization; and "general." Each class is subdivided; and in each, gas engineering problems, and questions of gas administration and finance, find a prominent place. Regarding the first class, it is suggested that consideration should be given, among other subjects, to the coal mining industry as a basis for national gas supply and to a comparison of the cost (in the commercial sense—not only with reference to fuel consumption, but including all other items such as wages, capital charges, &c.) of power as produced by gas and by steam. Three other important questions to be discussed are: Gas preparation, to ensure the most uniform and suitable chemical and physical characteristics without undue increase in cost; the connection between gas and its bye-products, particularly in respect of coke and the influence of turnover on the price level of gas and coke and on the cost of producing gas; and distribution of gas. Among the various phases of the latter problem, attention will be devoted to the installation of water and gas mains, together with electric cables, in a common tunnel. Another group of questions will concern the sale of gas—propaganda; competition with electricity, and the possibilities of co-operation; tariffs; and so on. Doubtless, too, papers will be contributed on the extent, nature, and value of control by public bodies with regard to the economic organization of gas and electricity undertakings, and the legal character of supply contracts for electricity and gas in the various countries. Sight is not to be lost of the development of the gas turbine and of the use of gas engines for small and large power plants; and it will be learned with satisfaction that consideration will be given to the smoke and soot nuisance in connection with electric power stations in large cities—a nuisance which is giving rise to grave anxiety. Altogether the Conference promises to be of the greatest interest and utility to the gas industry; and our readers may rest assured that through our columns they will be apprised of both papers and discussions.

Position of the Railways.

WHEN the great grouping of the Railway Companies was accomplished, it was naturally assumed that beneficial results would accrue from the cessation of much internal competition; but since that time external competition has come upon them with a severity which the grouping has done nothing to assuage. The Companies have, indeed, reached a stage now—if they had not reached it long ago—when faith can no longer be placed in the time-honoured method of making-up shortages by increases in charges. This fact is emphasized by the Railway Rates Tribunal in their first review of the standard charges under the Railways Act of 1921; for in their findings they state that there was a consensus of opinion between the Railway Companies and the traders that, owing to various factors in the economic position of the country, increases of rates were not practicable, inasmuch as they might tend to diminish rather than increase the volumes of traffic which are necessary to realize the standard revenues. Increased prosperity must now be sought in other directions than this; and in the search it appears likely that attention will continue to be focussed in considerable degree upon the various aspects of the wagon problem.

The basis of the Railways Act of 1921 is that the net revenue of a Railway Company shall equal what has been fixed as the Company's "standard revenue." Last year the presumed volumes of traffic were not realized; it being found by the Tribunal that there was an aggregate deficiency of something over £9,000,000. This result, they say, was not due to lack of efficiency or to want of economy in management; and unfortunately they are of opinion that deficiencies, not necessarily as large, but substantial in character, are likely to continue. Figures quoted by the Tribunal show that over £4,000,000 of the total deficiency was on account of the L.M.S.R.; while at the other end of the scale is the Southern Railway, whose net revenue fell short by some £237,000 of the standard. The judgment of the Tribunal points to not the least of the country's industrial problems.

Eighty Years Ago.

In the "JOURNAL" for June, 1849, we announced that a project was on foot for the formation of an "Institution of Gas Engineers." "There can be no doubt," we said, "of the usefulness of such an institution, if properly organized, and promoted by parties enjoying the confidence of the profession. We shall rejoice at its success, and shall be happy to co-operate in its foundation." Exactly eighty years later, except for one day, the "JOURNAL" recorded the remarks of Mr. John Terrace in officially announcing to the Institution the granting of the Royal Charter.

Consistency of Tar.

The original contribution of Mr. C. O. Condrup and Mr. H. M. Spiers, of the Research Section of the Woodall-Duckham Companies, to this issue of the "JOURNAL" is most important, and will be read with great interest. The authors show that distillation conditions have a profound effect on the consistency of tar. If, for example, the tar leaving a "T.I.C." still is allowed to cool slowly, its consistency is several times as high as when rapid cooling is effected. Experiments are described which indicate that, with increase in the heating period, there is a progressive rise in the consistency of tars of all types; but this increase takes place very slowly at temperatures below 150° C., and does not occur at all during one year's storage. The authors' investigation demonstrates that there is considerable flexibility in the preparation of road tars by straight distillation; and it is suggested that a still may be designed to yield a product in which the effect of "primary consistency" is even more marked than is shown by the results already attained. This is of interest in connection with the distillation of low-temperature tars.

Eliminating the Main Arch.

In an article in later columns, Mr. H. J. Toogood submits that refractories have so improved that the main arch of a horizontal setting is no longer necessary. He suggests that it is better to substitute a flat dead-weight bench cover, and adduces the following reasons for this: Increased efficiency; economy in construction of the setting; reduced costs of ironwork; absorption of the expansion of silica; and the fact that each setting can be independent of its neighbours. Conversion of existing settings from the main arch to the flat cover can be carried out cheaply and without difficulty; and Mr. Toogood maintains that the resulting economies in the standing, running, and setting charges will quickly repay the small cost of conversion.

Approaching 100 p.ct. Efficiency.

The very high thermal efficiency of the geyser is well known to all, and accounts for the low cost of hot water production by this means. In spite of lagging, efficient mixture control, small flue losses, and so on, the efficiency of the externally-heated gas circulating boiler, however, falls well behind the coveted 100 p.ct. mark. The cause of this is to be found in the limited area of contact of heat with the water inside the boiler, coupled with the almost non-conducting gas film on the boiler surface. Attempts to obviate these disabilities have been numerous, and partially successful. The plan has also been tried of eliminating the difficulties by burning the gas actually in the water itself; but practical drawbacks have up to the present retarded the adoption of this, from many points of view, theoretically ideal system of water heating for circulatory systems. There appears to be on the market now, however, a simple and compact apparatus employing this principle which, free from such faults as back-firing, in operation approaches a thermal efficiency of 100 p.ct. An illustrated description of this submerged combustion hot-water circulating unit—the result of work done during the past few years by Messrs. Hammond & Shackleton, of Submerged Combustion, Ltd.—will be found in this issue of the "JOURNAL," and is bound to create much interest. The apparatus occupies very little space, is automatically controlled, can be put into action at a few minutes' notice, and quickly operates at full output. The method of effecting circulation of the water is particularly fascinating. The value of the article is enhanced by incorporation of the results of a three-days' run, taken at random. The economy of the unit in operation is evident—this economy being due to a thermal efficiency of practically 95 p.ct. based on the gross calorific value of the gas. This high efficiency is brought about by the recovery of latent heat by condensation of water vapour in the exhaust. Tests indicated that there is no material tendency of the water to become acid (on the completion of a twelve months' run, water of an original *p*H value of 8·0 showed a *p*H value of 6·5), and thus corrosion is not to be feared.

A Disposal Problem.

Progress, while solving old problems, frequently introduces new ones. Lately, much interest has been taken in the question of what should be done with discarded safety razor blades. Some people, it seems, leave them about, to be cleared away in the domestic tidying up, and some others—apparently under the mistaken notion that they are no longer capable of harm—just throw them out of the window. The Walmer Urban District Council, through the introduction of modern methods, are confronted with another disposal problem, though not one presenting such possibilities of danger as the razor blades. In the matter of refuse disposal, the Surveyor reported to the Council that, perhaps as a result of the substitution of gas fires for coal fires, the quantity of paper carted to the depôt was increasing constantly, and was causing a nuisance. Gas fires are evidently attaining the position of popularity which they deserve at Walmer; and as to the plague of paper, this at any rate is far less serious than the plague of smoke which, thanks to the gas fire, it supersedes.

Federation of British Industries' New Headquarters.—The contract has now been signed for the erection of the new F.B.I. building on a site in Tothill Street, Westminster, upon which work will begin at once. The building will have a frontage of 90 ft. and a height to the roof of 80 ft. The building incorporates a new system of central heating by low-pressure steam, combining the advantages of both steam and water.

PERSONAL

After having practised at Southampton House, 317, High Holborn, W.C. 1, for over 21 years, Dr. R. LESSING, Consulting Chemist and Chemical Engineer, has taken over new premises at 94A, Horseferry Road, Westminster, S.W. 1, where he will be enabled to carry on his research and experimental work on a larger scale.

Mr. WILLIAM SCOTT EASSON, Engineer, Manager, and Secretary to the Peterhead Corporation Gas Department, has been appointed Manager of the Selkirk Gas Company, in succession to his father, Mr. DAVID EASSON, who has retired after holding the post for thirty years. A native of Perth, Mr. W. S. Easson was for over ten years Gas Manager at Jedburgh, whence he went to Peterhead in 1919. During his régime there, the output of gas has been increased from 57 million c.ft. to 75,680,000 c.ft., and the price reduced from 5s. 4d. per 1000 c.ft. to 4s. 9d. The Peterhead Town Council paid tribute to Mr. Easson's services when they accepted his resignation on June 10. Mr. Easson will be succeeded at Peterhead by Mr. WILLIAM RITCHIE.

Mr. THOMAS ROYDEN, Engineer at the Uddingston Gas-Works, has been appointed General Manager under the Gas Amalgamation Scheme of the County of Lanark, Middle Ward. This scheme amalgamates nine works—namely, Bothwell and Uddingston, Cambuslang, Bellshill, Holytown, Carfin, Larkhall, Stonehouse, Blantyre, and East Kilbride, of which only the first two are now manufacturing stations.

At the last meeting of the Council of the County Borough of Wallasey, held on June 6, the following two appointments—as recommended by the Gas and Water Committee—were confirmed: Mr. M. A. STONE, Assistant Works Manager of the Litchurch Gas-Works of the Derby Gas Light and Coke Company, was appointed to the post of Superintendent of the Gas-Works; and Mr. F. A. RHEAD, Assistant at the Stourbridge Gas-Works, was appointed to the post of Technical Assistant. There were 26 applicants for the former post and 31 applicants for the latter post, from which four applicants for each post were selected for interview by the Gas and Water Committee.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

June 21.—WESTERN JUNIOR GAS ASSOCIATION.—Visit to the Edmonton Works of Messrs. T. Glover & R. & A. Main, Ltd.

June 27.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council Meeting in the afternoon.

June 27.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at No. 28, Grosvenor Gardens, S.W. 1, at 2.30 p.m.

June 28.—INDUSTRIAL SALESMEN'S CIRCLE.—Meeting in London.

June 28.—WAVERLEY ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Edinburgh.

July 5.—MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—Visit to the Halifax Gas-Works and to the Works of Messrs. Drakes, Ltd.

July 9.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board.

Aug. 13-14.—IRISH ASSOCIATION OF GAS MANAGERS.—Meeting in Dublin.

Sept. 12.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting at St. Andrews.

ON THE ELECTRICAL SIDE.

Electricity and Agriculture.

Some big figures are quoted in an article which has been published in the "Financial Times," on the subject of electricity and the agricultural power load. It is admitted that the farm load which arises from the use of electricity for cooking, heating, chaff-cutting, milking, &c., is comparable only with that of a fairly large house, and is seldom sufficient to provide economic justification for the long transmission line which is usually necessary to reach a farm; but when to this is added the potential load represented by the major operations, the proposition becomes an altogether different one. "If," it is said, "electric power is used for the major operations of cultivation and harvesting—namely, for ploughing, harrowing, rolling, reaping, threshing, &c.—an industrial load of the very best kind is obtainable; and in the development of this load lies the promise of expanding the interests and earnings of electricity supply companies beyond even the bright prospects indicated by the present steady growth in general consumption."

Northamptonshire as an Example.

In the latest statistics of the Board of Agriculture with reference to Northamptonshire, the average area of a farm is given as just over 100 acres; but to secure a fairly representative unit, the author of the article in question assumes a double farm of 250 acres, one part of which is devoted to the production of crops from arable land, and the other to breeding cattle on the pastures for the live stock, meat, and dairy trades. Dividing the area of such a farm proportionately as regards arable and pasture land to the figures for the whole county, there would be required about eight horses for cultivating the arable land, harvesting the hay, &c.; and assuming 100 p.ct. electrification for all cultivating and harvesting operations, an annual consumption of 14,650 units for agricultural power is arrived at. This is made up of 12,250 units for 70 acres of arable land, and 2400 units for 40 acres of permanent grass for hay—the remaining 140 acres being devoted to permanent grass not for hay. On the basis of figures already published, such a double farm might be expected to consume about 10,000 units per annum for domestic and farmyard purposes, so that a total of 24,650 units per annum is reached. At 2d. per unit, this would involve the farmer in electricity bills totalling £205 a year. Allowing £1 a week for the upkeep of a horse, there is placed on the credit side a saving of £416, if all horses are dispensed with, and £312 if two of them are retained. The sum of £205 a year for electricity represents 20 p.ct. of £1025, which would cover the cost of a transmission line extension to the farm. Multiplying these figures for the whole county, the writer calculates a possible agricultural consumption for Northamptonshire of about 52 million units per annum, which is increased to about 60 million units when allowing for the areas in Buckinghamshire for which the Northampton Company holds the rights of supply.

Mention is made of the fact that the process of mechanization is now taking place with petrol-driven tractors as substitutes for horses; while steam ploughing on the cable system is also used to a considerable extent. It is, however, remarked that it is up to the electricity supply companies to direct the development into electrical channels. The suggestion is put forward that the sooner someone starts a 100 p.ct. electric farm, and runs it long enough to investigate every application of electricity to agriculture, the better it will be.

Teaching Electricity.

We had thought that the late Government had left no stone unturned in the way of boosting electricity; but this was evidently a mistaken notion. There is something else that could be done, and a writer in an electrical contemporary has now pointed it out. "The time has come," it is said, "when compulsory lessons in elementary electricity are as essential to the growing generation as lessons in civics and morals." The author does not say, as he might well have done, "as lessons in gas." But this was possibly due to a slip of the memory; for we hold that gas can claim to stand side by side with electricity in the service of mankind. Though avowing that the article in question was not written primarily from the point of view of advertisement, the writer says "it is almost incredible that the simplest, cheapest, most effective and permanent form of advertising has been overlooked. . . . If a general conception of electricity and its uses were implanted in the juvenile mind, it would be the first and most important step in eradicating conservatism and overcoming the present widespread indifference, and would tend to produce enthusiastic crusaders in the cause of electricity."

This looks vastly like propaganda—which is perhaps a more elegant word than advertising—and the following quotation tends to strengthen the impression: "It is necessary that the public should be educated in regard to the cost of electricity; for the average man in the street does not view this matter in the correct perspective. Let teaching follow the line that the cheapness of electricity cannot be judged solely by £ *s. d.* standards, but by standards of life, of comfort, and of convenience; for the supply of electricity is not a commodity, but a service—and that service which attains nearest to perfection in modern civilized life. The main thing is not to teach the growing generation 'electricity,' but to teach it to think electrically and to live electrically."

We are all for broadening the basis of knowledge; but this is a one-sided proposition which might result in the young mind acquiring only a half-truth. What about the many things which can (taking all factors into account) be accomplished better by other means than by electricity? Are the pupils to be left in ignorance of the fact that there are such other means? The gas industry must see to it that they are not—for the sake of the pupils, as well as in their own interests. This suggestion on behalf of our competitors is one that must not be lost sight of.

THE INSTITUTION VISIT TO BERLIN.

It was a representative party of over fifty from the British gas industry, including several ladies, which responded to the very cordial invitation of the German Gas and Water Association to attend their Seventieth Annual General Meeting in Berlin last week, with the Gas Exhibition as the centrepiece of the attractions. The visit was undertaken under the auspices of the Institution, and was led by the Retiring President, Mr. John Terrace.

IMPRESSIONS OF A MEMORABLE TOUR.

By W. RUPERT KING.

It is twenty-one years since Mr. Doig Gibb, as President, led an Institution party to Berlin, when an installation of high-pressure inverted lighting was one of the show pieces. It was therefore a matter of great satisfaction that Mr. Doig Gibb was able, on this occasion, to support Mr. Terrace. The President for the coming year, Mr. C. S. Shapley, and several members of the Council, made the party fully representative, and Mr. J. D. Smith, of Belfast, was another who had been of Mr. Doig Gibb's expedition.

The party assembled at Liverpool Street Station on Friday evening, June 7, ready, after the toil of Institution Week, for 24 hours' complete relaxation in boat and train. They found, alas, that the boarding of the Harwich-Hook steamer is liable to be accompanied by much turmoil; that, moreover, steamers have engines and machinery even when the sea is dead calm; and that this one in particular unloads its passengers and cargo very early in the morning. Nor was the long train journey found to be very restful; and Berlin, when reached soon after 5.30 p.m., was very heartily acclaimed. The party was quickly distributed among its three hotels, and it was only the very hardy members who dined out that night.

BERLIN.

It is no part of this story to describe Berlin. Indeed, with the full programme arranged, there was little time to see it. But several impressions will always remain. Wide, clean streets; trees everywhere; window boxes and city squares gay with flowers; sunshine all day and every day, without excessive heat. Berlin was certainly seen at its best, and of course the best of Berlin was seen. Hotels which must surely be among the finest in the world; taxis with a twopence half-penny minimum apparently driving in complete chaos but always just missing; cafés in the open air, where the world and his wife and family spend their leisure hours. Many of the party looked back sadly on the hours they wasted at school when they should have been learning German. Others were merely thankful that the national beverage is pronounced the same way in German as in English; others again soon added the word *gross* to their vocabulary. Certain members will long remember the beautiful Tiergarten—a large wooded park in the middle of the city through which they were personally conducted on foot by an energetic young German. It was indeed beautiful, but it was especially the largeness which impressed itself upon them. And so the story might continue. Berlin definitely received the approval of the Institution delegation.

A GREAT WELCOME.

It is impossible to speak too highly of the reception accorded by the German Association. A deputation, headed by their President, Dr. Schütte, was on the platform to meet the train on arrival, and among its numbers was Dr. Barth, of the Berlin Municipal Gas Undertaking, who was, thereafter, untiring in his attentions to the English party, and to whose energy much of the enjoyment of the visit was due. The hospitality of the Germans was unbounded. On arrival, each member received a book of perforated coupons, which contained a complete programme of the arrangements, with a coupon for each item. Meals at the meetings were provided for, excursions, a performance at the State Opera, and the official banquet of the Association all had their appropriate coupons, and Dr. Barth was always there to steer the party through every difficulty.

THE EXHIBITION.

Taking events chronologically, we must first refer briefly to the Exhibition, because at 9 o'clock on Sunday morning—an hour which some of the party found rather trying after the journey, but which they learned was considered very reasonable in Germany—cars arrived at the hotels to take them to the Kaiserdamm, where the Exhibition is being held.

In a narrative of this kind, it is useless to attempt any description in detail of the exhibits, especially as, in the opinion of many who saw the display, it must be seen to be believed. In another section we give a few impressions from the point of view of a "propaganda specialist." We must be content here to congratulate the German gas industry upon achieving an outstanding success with a gas exhibition upon a scale which has never been attempted anywhere before. In their own words, the promoters set out to give a display primarily for the public, but they aimed at the same time at providing interest for the technical man and the scientist. In this they have succeeded admirably, and there were ideas and wrinkles to be obtained everywhere. The predominant note was, however, showmanship. The magnificent halls are the permanent property of the Municipality, which has a Department especially devoted to propaganda, and the promotion of such undertakings as the Gas and Water Exhibition. Everywhere the hand of the expert was evident in the display of all the excellent material offered by the gas industry, and the combination has produced something entirely out of the ordinary.

One or two further impressions may be recorded. First, the

size of many of the exhibits. Naturally, only the large space available made this possible, but full-size sectional models of carbonizing and other plant, showing exactly "what it is like inside," make a great appeal, especially to the German public, who are perhaps more inclined to ask "how and why" than our own countrymen. A good start is made just inside the main entrance with a one-tenth scale model of a 3¼ million-a-day gas-works. Before a model, especially when the wheels begin to turn, every man becomes a boy again, and gas engineers proved to be no exception to the rule.

Next may be mentioned the co-operativeness of the effort, to which the promoters themselves pay the highest tribute. Manufacturing firms of all kinds have, of course, contributed largely, but their exhibits are merged in the general scheme in such a way as to leave no impression upon the public of individuals pushing their wares. The general lay-out and the colour schemes are highly artistic; the cost, though we have no exact figures, must have been enormous. The outlay upon

the model gas-works alone is said to have been about £12,500. The German gas industry is, of course, passing through a critical time, and has been faced, for some time now, with the machinations of those whose interests lie in carrying high-pressure gas supplies to all parts of the land from coke-ovens in the mining districts, from brown-coal deposits, or from any other source except the existing gas undertakings. They are powerful both politically and financially. It is presumably very largely this circumstance which has prompted the gas industry to an effort involving such an enormous outlay, and bringing so prominently before the public its vitality and up-to-date utility.

One more impression must be recorded before we pass, and that is the large number of parties of school children who were being conducted round the exhibits, who were asking innumerable questions, and generally taking a very lively interest. Whether the initiative was with the promoters or with the school teachers, we do not know. But they were there in force.

Social Functions.

Still recording chronologically, the President's Reception must next be described. To an Englishman it may sound strange, but all the business of the congress was transacted at the Zoological Gardens. In big German cities the Zoo is generally an important centre of social life, and in Berlin it possesses halls which are ideally suited for large gatherings, with restaurants and open-air cafés near at hand. And so to the Zoo there repaired on Sunday evening delegates numbering, including wives and families, well over two thousand. In the marble hall, they met their President, and, at innumerable tables, accommodating small parties each, supper was taken. The function was of great interest to the English party, being very typically German. An excellent orchestra played in a balcony, and this, with an occasional refilling of the beer mug and much conversation between the tunes, fully satisfied the world and his wife, though songs and ballet dancing by members of the State Opera were very great attractions.

On Monday evening the delegates filled the State Opera House for a specially arranged performance of "Don Giovanni;" the size and earnestness of the audience conveying a vivid impression of the German devotion to music, and the perfection of the performance making some of the English party sigh for a greater demand in England for high-class opera. Here, as at the reception, the seats of honour were accorded to the foreign visitors.

On Tuesday evening, once again at the Zoological Gardens, the official banquet took place. Again a vast concourse; a slightly more formal function; further excellent orchestral music, artistes and dancers from the opera; and finally the decks cleared for dancing until the small hours. The President's announcement that his would be the only speech of the evening met with general approval, and his theme, in very few and very well spoken words, of "let us eat, drink, and be merry, for to-morrow we have work to do," showed a true perception of the spirit of the gathering.

The Meetings.

And now once again to more serious matters. The Exhibition, which we have already discussed, told its own story in no uncertain way. The wild animals which were passed on the way to the meeting hall made their usual appeal. But, alas, to most of the Institution party the proceedings within were utterly unintelligible. And yet they found that every other German had at least a slight acquaintance with the English tongue. There was a great deal of interesting material in the papers, and we shall take the opportunity, as they become available for publication, of giving further particulars of some of them. For the present a brief reference must suffice.

In opening the proceedings, the President, Dr. Schütte, of Bremen, welcomed the large gathering, and expressed the especial pleasure which the German industry had in welcoming the delegates of fourteen other nations. M. Ellissen, President of the Union Syndicale de l'Industrie du Gaz en France, expressed on behalf of them all great appreciation of the welcome they were receiving in Berlin.

Among the papers read was a very interesting communication by Herr Schäfer, of Ingolstadt, on the "Prevention of Gas Losses in the Distribution System"—a subject which is highly topical in the light of the severe weather of last winter. He spoke of the chaos which exists under the streets in many parts, and of means which are being taken to remedy such a state of affairs. He discussed further the need for careful consideration in selecting different material and different joints according to local conditions and subsoils; the scope that still exists for investigation of the causes of corrosion, whether electrolytic or chemical; and means that can be adopted for the prevention of disturbances due to this cause.

Dr. Prüss gave a paper on the subject of the phenols in effluents, describing several methods of treatment which have been considered in connection with the enormous concentration of coke-ovens in the Ruhr district. The process chiefly adopted has been the removal of the phenols from the crude liquor by washing with benzole; the phenols being subsequently separated by distillation or by washing with caustic soda. The process works so economically that its cost, in reasonably favourable circumstances, is covered by the sale of the phenols extracted. To deal with other harmful constituents of coke-oven effluents, a sum of £150,000 has been spent in the last two years on the world's largest mechanical settling plant, which treats the whole of the effluents from the Ems before they reach the Rhine. Some 250,000 cub.m. of sludge are recovered in a year. This is to be dried, and used in pulverized state for boiler firing. An electric generating station is to be erected in the neighbourhood for an annual production of 100 million kilowatt-hours.

Dr. W. Bertelsmann, Chief Chemist of the Berlin Munici-

pal Gas Undertaking, described recent developments in coal analysis and evaluation, and Dipl. Ing. Schneider, of the Karlsruhe Gas Institute, discussed the necessity for accuracy in gas analysis methods, in order to ensure regularity in the quality of supplies. Other subjects dealt with were makers' guarantees for oven productions, by Dr. K. Bunte, of Karlsruhe; appliances for locating gas leaks, by Herr Rodde, of Stettin; and present-day considerations on the question of gas tariffs, by Dr. R. Nübling.

The old question of carbon monoxide was handled in a very interesting manner by Dr. H. Kemmer, of Berlin. He discussed several processes, and, in his opinion, the most hopeful at present for the removal of carbon monoxide from town gas is by liquefaction and fractional distillation. The whole question, however, remains very largely one of costs; there are still great, if not insurmountable, difficulties, and much and costly

experimenting has to be done before a practicable solution is found.

VISITS.

A large selection of visits to works was available, with motor transport provided and guides everywhere. In fact, it is no exaggeration to say that every German seemed anxious to show every Englishman everything. The gas supply of Berlin is still divided between two concerns. One, though working under company law and organization, is purely municipal in ownership. The other consists of the old concession of the Imperial Continental Gas Association, which runs until the year 1975; and in this the Municipality holds a controlling interest. Most of the English party on the first afternoon visited the Mariendorf Works of the Gasvertriebsgesellschaft, which is still familiarly referred to as the "English" Company, and of which a very old friend, Ernst Körting, is still Director. This has always been a show place, and was one of the centres of attraction on the occasion of the last official Institution visit

A Scene in the "Tiergarten."

already referred to. Contrary to modern custom in Germany, carbonization is still carried out in Dessau vertical retorts; the more fashionable chamber ovens having not yet been adopted. But "rationalization" has done wonders with cubic metres per ton and per man in the last few years. The present daily make is nearly 9 million c.ft., and a maximum of 14 millions is attainable when "all out." Refreshments were served in a spotless canteen, which gave Mr. Tarratt an opportunity of expressing gratitude to the officials for a most interesting visit.

On the Tuesday, Mr. Terrace and a large party assembled at the Neuköln Works of the municipal undertaking, where the maximum day is about ten-and-a-quarter million c.ft. Here nearly the whole carbonizing plant is in vertical chambers, with a small unit of horizontal chambers in reserve. The largest verticals are charged with about 5 tons, and have a carbonizing period of 24 hours, or 32 hours with steaming.

Another very interesting visit was to Messrs. Junkers' Works at Dessau, the feature, apart from the inspection and hospitality, being that the firm took the party both ways in four of their own aeroplanes. [Regarding this, Mr. B. R. Parkinson has favoured us with a special note—see below.]

EXCURSIONS.

The ladies were well catered for, and suitable entertainment was provided for them every morning while their menfolk were at the meetings or the Exhibition. The main excursion, which appeared to attract the whole of the several thousands assembled in Berlin for the meeting, was by motor omnibus and charabancs to Potsdam. Through wonderful wooded country, a drive of nearly one hour was thoroughly enjoyed in brilliant sunshine. A ramble through the glories of Sans Souci and the Imperial Palace of happier days was followed by a steamer trip on the Wannsee, Berlin's beautiful lake.

After a very eventful stay in Germany, the party dispersed on Thursday, June 13, some to return direct to England, others to make further journeys of discovery. Whatever their destination, it is safe to say that there was not one single regret at having made the trip to Berlin.

VISIT TO DESSAU.

By B. R PARKINSON.

On Wednesday, about thirty of the British delegates, including several ladies, accepted an invitation of the well-known firm of Junkers & Co., to visit their works near Dessau (Fabrik für Prof. Junkers Warm-wasser-apparate und Badeöfen). The invitation was given and carried out with such regal hospitality that every member of the party, without exception, marked the occasion as a red-letter day. As time was short and the journey about a hundred miles, the Company arranged to send a fleet of aeroplanes to the Tempelhof Aerodrome at Berlin to convey us to the private aerodrome, near Dessau, of the Junkers establishment. The machines took off at 9 a.m., and the journey occupied about fifty minutes.

On arrival we found a photographer in attendance who took a group of the party by the aeroplanes. Names and addresses were taken, so that each guest might subsequently receive a copy. Then we proceeded to the offices, and were at once seated to a table-d'hôte breakfast, where speeches of welcome were made. This was followed by a cinema entertainment in an adjoining theatre specially constructed for propaganda films, very handsomely appointed and comfortable. The picture submitted lasted over one hour, and represented the history and psychology of bathing and baths, all leading up to a climax in the Junkers labour-saving water heater. Customs of all ages and all nations were illustrated; scenes artistic, humorous, and grotesque—but, let it be said, the fare was served with very nearly sufficient propriety to satisfy British discrimination. The film was said to have cost £3000 to produce; but when we were informed that Messrs. Junkers supply over 80 p.ct. of the world's output of water heaters (excluding North America), and that 40 p.ct. of their output is for export, we understood the scale on which their propaganda work must be conducted.

We were next taken over the works where the gas-heated water heaters are made. The technicalities of construction follow lines similar to British makes, but the scale on which the manufacture is carried out impressed the visitors with the virility of the gas industry so far as water heating is concerned.

Of exceptional interest were the works welfare arrangements. The ambulance department includes complete medical and surgical equipment, with sun-ray treatment. The last-named is available three days of the week for men and three days for women. Tired workers come through the course greatly refreshed. Working hours are about the same as in Britain, but the day begins earlier. Then there is the institute and training school. Free classes are offered in English, French, and Spanish, or any other language. Apprentices are instructed in the manufacture, repair, and maintenance of apparatus. For this purpose all types of water heater are shown by means of sectional models, a feature of German illustration which is so notable at the Exhibition. Training is here also given to teachers—that is, to officials of the Company who are sent out, at home or abroad, to instruct in the working of the apparatus supplied. It is understood that the firm are establishing works in England at Hither Green, London.

The Company are also manufacturers of aeroplanes, but our acquaintance with that part of their business was confined to the unique experience of air travel to the works and back. In the afternoon we were taken for a most delightful excursion. Motors were in readiness to convey the party through the town of Dessau to Wörlitse Park, the seat of the Duke of Anhalt, about 20 miles beyond, where our party were again entertained

Potsdam—the Imperial Palace.

at luncheon by the lake. Afterwards we were surprised to find large flat-bottomed boats awaiting us at the landing-stage, each with a table spread with coffee cups, and one extra boat carrying a band of musicians. The row on the lake in peerless weather and beautiful scenery was unforgettable. We landed, and walked through grottos and tunnels, by the Temple of Venus, the Gothic House, and the Castle; thence returning by boat and by motor car to Dessau.

The hospitality which we received during the day missed no detail of preparation and forethought, and was accompanied by a personal touch that greatly impressed everyone. Dr. B. Friedman, Managing Director of Junkers & Co. (Great Britain) Ltd., gave up the whole day to us, as also did Herr H. Blume, Manager of the Dessau Works. Both spoke English fluently. Two or three other officials of the Company accompanied the party throughout. At the table, our warm thanks were voiced

in a felicitous speech by Mr. A. A. N. Carpenter, of London, followed by Mr. George Keillor, of Greenock, and Mr. T. F. E. Rhead, M.Sc., of Birmingham. There were references to the famous Junkers calorimeter which has made the firm known in Britain, and hopes were expressed that the commercial relations of our two countries may be strengthened to our mutual advantage, and that such kindness as we had received that day should augur well for a good understanding between the peoples. Certainly the visit made a remarkable impression upon those who took part in it. In taking leave, every visitor was presented with a water heater and enamelled bath complete.

At the end of a long day, the party stepped into their aeroplanes at the works aerodrome as unconcernedly as though they were entering taxicabs. One couple who had preferred to come by train were persuaded to return by air. We left at 8 p.m. and reached Berlin at 8.50 p.m. There it was found that owing to the filling up of all available flying seats (inadvertently), Dr. Friedman had quietly stood aside and been left behind, much to the regret of all the party, especially as Mrs. Friedman was with us. The good Doctor had to make the long journey by road.

One of the Junkers aeroplanes used to convey us was the D901 "Ostmark," which flew in 1926 from Berlin via Moscow to Pekin and back. We were also informed that the great record altitude flight that was made last year took off from the Dessau aerodrome. During that flight, on a hot day in June, the thermometer registered 55° C. below zero at the tremendous altitude of 12,700 metres (9½ miles). The highest we went up was 5000 ft., nearly one mile.

BERLIN IMPRESSIONS.

A Propaganda Point of View.

By W. M. MASON.

The great German Exhibition is well worthy of a visit and cannot fail to impress all who have gone through it with careful and critical consideration. It is great in conception, in remarkably effective staging, and in bold investment of huge expenditure.

To the gas engineer faced now or in the near future with works extension, the Exhibition is valuable in displaying many modern schemes and working ideas, and wonderful working and display models—many of them on an unusually substantial scale and in actual operation. Nothing at all approaching the general display of works plant and accessories, bye-product handling apparatus, and refractory products has ever hitherto been attempted anywhere. Some of the domestic appliance sections with which British eyes are most familiar—as displayed so well at the British Industries Fair at Birmingham, for instance—are not nearly so much in evidence, but they are there; and the exhibit of cookers, water heaters, and other household apparatus is quite good, although not nearly up to our British exhibition standard, mainly because of Continental climatic conditions, household habits, and so on. It is significant, however, that the main feature of the Continental cooker which the writer strongly pressed after the official visit to a previous German exhibition at Munich in 1914—viz., the fine enamel and plated finishes—has now largely been adopted by us. It was emphatically asserted previously that such a type of cooker could not be economically maintained, and that the British public would never buy it. The growing demand for easily cleaned and attractive homes has changed that point of view; and the change is for the better.

Several features of the show made special appeal to the writer. It is finely staged in ideal permanent exhibition buildings, having adequate room perfectly adapted and equipped for the purpose.

Then the showman's hand is very evident, and it is hardly necessary to be told that the City of Berlin has a permanent exhibition staff which helpfully co-operates in all the preliminary organization, and brings general exhibition and publicity experience into the scheme. The engineers keep the advertising men right practically and scientifically, but the advertising and display experts not only arrange the whole lay-out and stands to the best advantage, but introduce all sorts of moving and working operations which are intriguing in their attractive and educational interest. The moving display of gas meters in a great variety of operations is a fine example.

Beautifully illuminated photographic transparencies are an attractive feature, and there are many fine, though simply arranged, tableaux of a number of works and products processes. A huge "cut-out" products tree is a fine example of general educative publicity.

The illustrations of ways in which gas—based on a small unit such as a pennyworth—can help in the home and in industry was perhaps, to our way of thinking, crude, but it was attracting attention, and when viewed from certain points of view "got home" in a convincing way. The lighting effects were an effective feature.

The really astounding thing about the effort, however, is that for an educative appeal lasting—as far as the actual display is concerned—a hundred days, the relatively enormous financial outlay of approximately half-a-million sterling should have been forthcoming. It is a bold and significant pointer to German faith in publicity and propaganda, and to a real sense of proportion in considering selling methods in relation to capital interests and works and factory output. In this one united and remarkably effective display the German gas industry has invested approximately as much as the British Commercial Gas Association has invested in seventeen years on behalf of the industry on our side. We have our own opinion as to which is most suitable and effective; the point is simply the big conception behind the show.

Another particularly significant point, emphasizing the call for the modern salesman, emerged at one of the visits organized in connection with the meeting. These were, incidentally, most useful, and were largely attended by delegates, some of whom travelled by air to distant works. One of the parties happened to come into touch with a class of schoolboys (ages about 12 to 14), and found that all these little lads could converse intelligently in English. They were a little dubious about Scotland being the most wonderful country in the world, but their doubts were shaken when they learned that great men like Carlyle and Burns and Scott and Kelvin had been Scots. They knew all the famous names except John Terrace. What a nation of overseas salesmen in the making is being raised in Germany!

About Berlin as a city, with its lovely trees and waterways and gardens; its cleanliness; the way the people put their backs (frequently bare and brown) into their work—these and other obvious national characteristics greatly impressed the delegates. The feeling generally expressed was that here is a great nation, working strenuously and unitedly to the building up of renewed and better trade and industrial prosperity, and deserving of all success in the effort. The friendliest and most helpful spirit of hearty goodwill was a marked and happy feature of the visit.

GLIMPSES INTO THE PAST.

From the "JOURNAL" Eighty Years Ago.

Clay Retorts.—We advise such of our readers as have not yet examined the question of clay retorts to do so without delay. During the last two years their manufacture has made immense strides, and we have little doubt of their finally superseding iron ones to a great extent.

Vulcanized Indiarubber.—There seems to be no limit to the uses to which this article may be applied. Jenning's gas cocks and valves are an instance of this, and, as they are now extensively used at the new Houses of Parliament and elsewhere with great success, their utility is practically demonstrated.

Bedford County Prison.—The county magistrates have accepted the tender of an individual to supply all the gas required for the county gaol, for a period of twenty-one years, at 5s. per 1000 c.ft. The quantity consumed annually is about 200,000 c.ft., giving a rental of about £50—rather a doubtful speculation, we suspect.

Coal Tar.—A correspondent desires us to state, in reply to the question of Mr. Radley's in one of the numbers of the "Gas Gazette," "whether the entire of coal tar is volatile," that he has experimented upon it, both in an intensely hot furnace and by the action of a blowpipe, and the result is an indestructible residuum of a greater specific gravity than iron.

Hydrocarbon Gas.—We understand that Mr. White, the patentee of this system, is constructing an experimental apparatus on a large scale in Belfast, under the patronage of the lighting and improvement commissioners. We may thus hope for an early solution of the question of the practicability of making gas from coal tar and other carbonaceous liquids.

Novel Mode of Manufacturing Illuminating Gas.—A very interesting experiment was recently tried by M. Livenais, of Bordeaux, and Dr. Berhardt, at the chemical lectures of the faculty in Paris, in the presence of several members of the Academy and many other *savants* and manufacturers. The fact to be demonstrated was that, by the decomposition of grape skins and wine lees in a close vessel, carburetted hydrogen gas would be disengaged of such a superior quality as to lead to the supposition that it might be used with advantage in place of the gas ordinarily obtained from coal and resin. Half-a-kilogramme (about 1 lb. English), upon being put into an incandescent retort, furnished in less than seven minutes 200 litres (a litre equals about a quart English) of carburetted hydrogen gas. This gas, on being supplied to a burner, burned with a bright-white light. It is entirely free from smell, and the flame may be raised to a great height without smoke. A second experiment made with dried wine lees gave an equally satisfactory result. By this simple means anyone may manufacture his own gas in his own house at a very trifling expense.

Destructive Fire at the Edinburgh Gas-Works.—An explosion startled the inhabitants of Edinburgh on Thursday, Jan. 25. An intense vibration of the earth shook the houses near the

Canongate; the inmates were in some cases thrown down, and the windows broken. The cause of the disaster was soon ascertained, and the attention of the crowds who thronged to the spot was drawn to a sheet of bright flame, arising from the gasholder of the Edinburgh Gas Company, which told too truly that the immense quantity of gas which it contained had, by some means, caught fire. In another moment the whole was one sheet of flame. The crowds lined the Calton Hill, Regent Road, and the adjoining points from which a view could be obtained, forming, as it were, a vast amphitheatre in the distance. The fire continued to blaze with great fury until gradually, as the gas was consumed, the gasholder became immersed in the tank amongst the water beneath, and the conflagration was ultimately extinguished by means of wet blankets and coarse sacking being spread over the shattered remains of the gasholder. The mysterious part of the matter is by what means the gas in the holder became ignited. There were in the gasholder at the time nearly 300,000 c.ft. of gas, the greater proportion of which would, of course, be consumed. The total damage was estimated at about £20,000.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later page.]

WITH the opening of the new account there was a burst of strength on the Stock Exchange last week; but unfortunately uneasiness over the monetary position and doubts regarding the Government's plans caused a reaction, and business slipped back to what has become "normal" irregularity. Several efforts were made to create interest, but, apart from transactions in a few specialities, markets remained dull and depressing.

Having regard to the prevailing conditions, business in the Gas Market was quite up to expectations. There are, however, several parcels of stock available for purchase. It will be seen by the Table that there were numerous changes in the quotations, but, other than a drop of 1s. to 19s.-21s. in the Bombay £1 shares, and 10 points to 430-450 in Imperial Continental ordinary stock, there is nothing remarkable to record. Confidence still prevails in the Primitiva ordinary, now standing at 37s. 9d.-39s. 6d., and the announcement at the meeting to be held on June 25 is being awaited with interest.

The following transactions were recorded during the week:

MONDAY.—British 117, 5 p.c. deb. 96¼, 96½, Croydon max. div. 84, 84¾, European 17½, 17¾, 18, Gas Light and Coke 19s. 6d., 19s. 7½d,. 19s. 9d., 3½ p.c. max. 63¾, 64, 4 p.c. pref. 77¼, 78, 5 p.c. deb. 101½, Imperial Continental 440, 441, 442, 443, 445, 447, 448, Newcastle 3½ p.c. 17s., 17s. 3d., Primitiva 37s. 3d., 38s., 38s. 3d., 38s. 6d., 38s. 7½d., 38s. 8¼d., 38s. 9d., 39s., 39s. 3d., 39s. 4½d., 39s. 6d., 39s. 9d., South Metropolitan 105, 105¾, 3 p.c. deb. 59½, South Suburban 5 p.c. 107½, 108, Tottenham 3½ p.c. 107, 4 p.c. deb. 76. Supplementary prices, Tottenham 5 p.c. pref. 90, Yorktown (Camberley) new 5 p.c. pref. 93.

TUESDAY.—Alliance and Dublin 97⅛, 98, Barnet 7 p.c. max. 116½, 117, Bombay 19s. 9d., Brighton and Hove 5 p.c. 100½, 102, Commercial 97½, 98, Gas Light and Coke 19s. 4½d., 19s. 6d., 19s. 7½d., 19s. 8½d., 19s. 9d., 19s. 10½d., 3 p.c. deb. 61, Imperial Continental 438, 440, 442½, 445, 446, 447, Newcastle 3½ p.c. 17s., Primitiva 38s., 38s. 3d., 38s. 6d., 38s. 7½d., 38s. 9d., 38s. 10½d., 39s., 39s. 1½d., 39s. 3d., 39s. 6d., South Metropolitan 104½, 105¾, 6 p.c. pref. 108, Wandsworth (Wimbledon 5 p.c.) 117, 118. Supplementary prices, Liverpool 5 p.c. 94½, 95½, Mid-Kent 75s., Preston "A" 130, Swindon United 70½, 71.

WEDNESDAY.—Brighton 6 p.c. 115, 115½, British 5 p.c. deb. 96½, Croydon sliding-scale 111½, European 17½, Gas Light and Coke 19s. 6d., 19s. 7½d., 19s. 9d., 19s. 10½d., 20s., Imperial Continental 437, 438, 439, 442½, 444, Newcastle 3½ p.c. 17s. 1½d., Primitiva 38s. 6d., 38s. 9d., 38s. 10½d., 39s., 39s. 1½d., 39s. 3d., 39s. 4½d., 39s. 6d., 4 p.c. con. deb. 79½, 4 p.c. deb. (1911) 80½, South Metropolitan 104¾, 105½, 6 p.c. pref. 109, Uxbridge 5 p.c. 96, 97. Supplementary prices, Associated Gas and Electric "A" $56, Bournemouth 7 p.c. deb. 101¼, Liverpool 5 p.c. 95½.

THURSDAY.—British 119, 119½, Cape Town and District 4½ p.c. deb. 75, European 17⅞, Gas Light and Coke 19s. 7½d., 19s. 9d., 19s. 10½d., 20s., 20s. 1½d., 20s. 3d., Hornsey 3½ p.c. 87, Imperial Continental 437, 438, 442, 444, Primitiva 38s. 6d., 38s. 9d., 39s., 39s. 1½d., 39s. 3d., 39s. 4½d., 4 p.c. deb. (1911) 81, South Metropolitan 104⅝, 105½, South Suburban 5 p.c. 108⅜. Supplementary prices, Associated Gas "A" $54, Hornsey new 5 p.c. pref. 87, 4 p.c. deb. 72, Swindon United 5 p.c. 70½, Yorktown and District new 5 p.c. pref. 92¾.

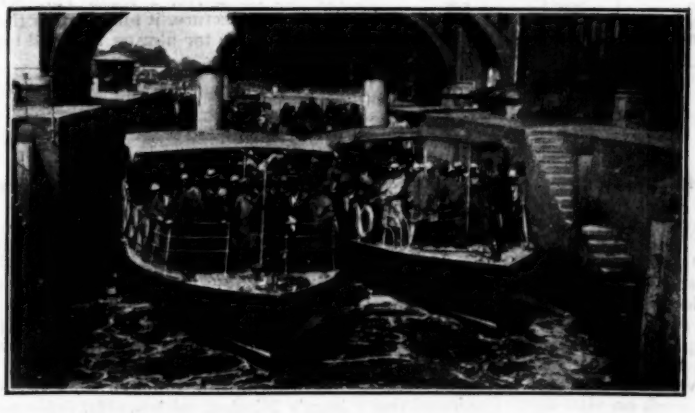
FRIDAY.—Aldershot 4 p.c. pref. 72, 73, Alliance and Dublin 96½, Barnet 7 p.c. max. 116½, 117, Commercial 3 p.c. deb. 56½, Croydon sliding-scale 111½, 112, 114, European 17⅛, Gas Light and Coke 19s. 9d., 19s. 10½d., 20s., 3½ p.c. max. 62¾, 63½, 5 p.c. deb. 100, Imperial Continental 431, 435, 436, 440, Primitiva 37s. 9d., 38s., 38s. 3d., 38s. 4½d., 38s. 6d., 38s. 7½d., 38s. 9d., 38s. 10½d., South Metropolitan 105½. Supplementary prices, Guildford 110, 115, Montevideo Dry Dock new 1s. 6d. pm., Uxbridge 4 p.c. deb. 73½, Yorktown and District new 5 p.c. pref. 92½, 92¾.

Money was not so plentiful as is usual at the end of the week, and 4¼ p.c. was charged for both old and new loans, easing towards the close to 4 p.c. Discount rates were not quotably altered, and Treasury Bills were allotted at an average of £5 6s. 5·67d. p.c., or just over 5d. p.c. below the previous week's rate.

On the Foreign Exchange Market, Sterling on New York developed a little better tendency, closing with a slight gain at 4.84 3/16. Other changes were small and irregular. Belgas finished at 34.91½; Italian lire at 92.67; Spanish pesetas at 33.89½; Dutch florins at 12.07½; German reichsmarks at 20.33½; and French francs at 124.03.

Silver was slightly higher at 24 7/16d. per oz., while Gold remained at 84s. 11½d. per oz.

The Bank Rate is 5½ p.c., to which it was raised from 4½ p.c. on Feb. 7. The Banks' deposit rate is 3½ p.c., and the deposit rates of the Discount Houses are 3½ p.c. at call and 3¾ p.c. at notice.



RICHMOND LOCK, JUNE 7.

(A happy snapshot by Mr. R. W. Broadhead.)

EFFECT OF DISTILLATION CONDITIONS ON THE CONSISTENCY OF ROAD TARS.

By C. O. CONDRUP, B.Sc., A.R.C.Sc., A.I.C., A.M.I.Chem.E., and H. M. SPIERS, M.A., B.Sc., F.I.C., Research Section, the Woodall-Duckham Companies.

In a recent paper, W. Gordon Adam and J. S. Sach ("JOURNAL," **186**, 141, 1929) have shown that the "free carbon" content of distilled tars is affected very considerably by the distillation conditions; slow distillation and the consequent exposure of the tar to relatively high temperatures for prolonged periods leading to a synthesis of "free carbon," with the result that much more of this substance is found in the residue than was present in the original tar.

The experience gained in connection with tar distillation by the "T.I.C." lead bath system, both on the large scale and in the laboratory, has shown that distillation conditions have a very profound effect on another property of the distilled tar—namely, the consistency of the product. It has, for some years, been known that the fact that in the lead bath system of tar distillation the pitch yield is considerably lower than is obtained under conditions of batch distillation is due to the shortness of the period—approximately 3 minutes—during which the tar is in the still. In this connection, it has been found that, if the tar leaving the still is allowed to cool slowly, its consistency is several times as high as is the case when rapid cooling is effected.

The phenomenon was first rendered evident during the course of an investigation of a tar of high water content. With a view to dehydrating the tar without altering its properties through an abnormally prolonged exposure of the tar to high temperatures, a small still on the lead bath system was constructed. Suitable connections were fitted for charging tar and withdrawing residue and vapours. It was found possible to handle as much as one gallon of tar per hour in this small still; the throughput depending on the temperature at which the still was operated and on the degree of topping to which the tar was subjected.

When the first batch of tar was treated in the still, the desire was to distil off a certain proportion with a view to obtaining a residue tar having a consistency of 10 seconds at 30° C. with a consistometer in principle like that of the "B.R.T.A." instrument. The amount of topping required to produce this result when distillation was carried out in a 1-gall. pot still had previously been ascertained. The alloy still was adjusted so that the desired amount of distillate was obtained, and it was found that the consistency of the product was less than three seconds. It was suspected that the consistency of the product might be brought to the anticipated value under the influence of heat. Samples were therefore boiled under a reflux condenser for varying periods, and it was found that with increase in the heating period there occurred a progressive rise in the consistency.

Experiments in which the product was maintained at definite temperatures for a fixed time in a flask under a reflux condenser were then carried out with a view to ascertaining the minimum temperature at which the rise in consistency occurs.

The results were as follows, the tar being a product from continuous vertical retorts:

Boiled Under Reflux Condenser. Temperature, 257° C.		Heated Under Reflux Condenser.		
Time.	Consistency.	Time.	Temperature.	Consistency.
Not heated	2·8 secs.	Not heated	..	2·8 secs.
3 mins.	4·4 ,,	180 mins.	150° C.	4·2 ,,
30 ,,	5·8 ,,	180 ,,	175° C.	5·4 ,,
60 ,,	7·4 ,,	60 ,,	200° C.	5·8 ,,
180 ,,	10·5 ,,	180 ,,	200° C.	8·0 ,,
		180 ,,	257° C.	10·5 ,,

The increase in what may be called the "primary consistency" takes place very slowly at temperatures below 150° C., and does not occur at all during one year's storage.

Interesting results were obtained with samples of products from "T.I.C." plants.

Two methods of handling the residue tar have been adopted, depending mainly on whether straight road tars or bitumen mixtures are required. In the former case, the tar leaving the still is generally water-cooled, and its temperature is rapidly reduced. In the latter case the tar is passed to large tanks into which the molten bitumen may be run. Under these conditions, cooling is very slow.

A sample of water-cooled distilled tar with a consistency of 2 seconds developed a consistency of 8 seconds (a fourfold increase) after being boiled under a reflux condenser at 260° C. for 3 hours. On the other hand, a sample of slowly cooled distilled tar with a consistency of 14·5 seconds developed a consistency of only 21 seconds (a 50 p.ct. increase) after being refluxed for 3 hours at its boiling-point—257° C. The first of these tars was a horizontal retort tar, the second a vertical retort tar. The phenomenon of primary consistency is thus shared equally by tars of both types, since, as has been indicated, the results in the foregoing table relate to a vertical retort tar. Similar results have been obtained with tars of higher consistencies. From a coke oven tar a residue was obtained in the experimental lead still with a consistency of 6 seconds, compared with 80 seconds obtained in a 1-gall. pot still with the same degree of topping. The effect of heat on the rapidly cooled tar compared with that on the slowly cooled tar is readily apparent. In the case of a road tar prepared in a 1-gall. pot still, the consistency increased only from 19½ seconds to 21½ seconds after refluxing for 3 hours.

SIGNIFICANCE OF PRIMARY CONSISTENCY.

The above results indicate that there is considerable flexibility in the preparation of road tars by straight distillation, since, with a still in which the time contact is short, a tar of predetermined consistency may be obtained either by topping off a definite proportion and cooling the residue tar slowly, or by topping off a much larger proportion and cooling the residue tar quickly. In this connection it may be pointed out that topping to the extent of an extra 4 p.ct. calculated on the weight of the tar gives rise to at least a threefold or fourfold increase in the consistency. The possibility of arriving at the desired consistency while at the same time removing more than the normal proportion of distillates is often of importance in cases in which difficulty may be encountered in reducing to the specified amounts the content of tar acids or of naphthalene.

Indications have been obtained that, by suitable modifications, a still may be designed to yield a product in which the effect of primary consistency is even more marked than is shown in the table; and this is of interest in connection with the distillation of low-temperature tars, since with these tars thermal decomposition during distillation is specially to be avoided.

In connection with the use of road tars having a primary consistency, it may be feared that the normal consistency of the tar might be developed when the tar is heated in the boilers on the roads. This, however, is not likely to occur, since change of consistency at temperatures below 150° C. is very slow and the temperatures recommended for tar spraying by the Roads Department are 105° to 115° C. for a No. 1 Road Tar, and 132° C. for a No. 2 Road Tar. On the other hand, though this is a conjecture, it may be that the normal consistency would develop in the tar film on the road under the action of light and air.

Determination of Viscosity in Absolute Units.—A revised issue of B.S. Specification No. 188, 1929—"British Standard Method for the Determination of Viscosity in Absolute Units"—has just been published by the British Engineering Standards Association. The first edition of this specification appeared in 1923, and the present revision was undertaken in the light of criticisms and suggestions which have since been received. The opportunity was taken of recasting the entire specification and also of introducing data likely to be of service to users. The revised specification should prove of considerably increased value to all laboratories engaged in work on viscosity. Copies of the specification can be obtained from the Publications Department, British Engineering Standards Association, 28, Victoria Street, S.W. 1, price 2s. 2d., post free.

British Economic Mission to Australia.—A series of important resolutions on the subject of Anglo-Australian trade relations were passed by the Executive Committee of the Federation of British Industries after careful consideration of the Report of the Economic Mission which, under the Chairmanship of Sir Arthur Duckham, recently visited the Commonwealth. They placed on record their high appreciation of the valuable services rendered to inter-Imperial trade by the Mission under the Chairmanship of Sir Arthur Duckham, and expressed the hope that no opportunity will be lost by His Majesty's Government of following up the valuable work performed by Sir Arthur Duckham's Mission, with special reference to the question of facilitating trade between the two countries and of endeavouring in collaboration with the Australian authorities to reconcile any divergence of interest.

MODERN COKING PLANTS IN THE RUHR COAL FIELD.

During the last two or three years, very large and elaborate coking plants have been built and put into operation at certain Ruhr collieries, and it is claimed that, as regards capacity, the combining of utility with architectural beauty, and the technical innovations embodied in them, they surpass even the large centralized coke oven plants erected in the United States during the war. An interesting account of the development and performance of these plants is given by W. GOLLMER in a recent issue of "Glückauf;" and the following translation appeared in a recent issue of the "Colliery Guardian."

At the beginning of 1926, there were 140 obsolete coking plants operating a total of 16,200 ovens capable of producing 28 million tons of coke per annum. Down to the commencement of 1928, 2770 new ovens were erected at 32 different plants; 1060 of these being enlargements and improvements to existing plants, and 1710 ovens erected at entirely new coking plants. There are now 36 large coking plants (in addition to 4 existing ones) comprising 7000 ovens, capable of producing altogether 24·9 million tons of coke; 15·3 million tons of this output being produced in the 2770 new ovens.

The oven chambers have been increased in height and length, but a certain minimum width has been adhered to in view of the size of coke the ovens have to produce. The average length of the new oven chambers is from 39½ to 42½ ft., and this seems to be the limit until other methods are discovered for smoothing down the coking coal and discharging the oven chambers. The increase in oven capacity is due to the adoption of a greater height, practically 50 p.ct. of the new ovens being more than 13 ft. high. The ovens installed are of various makes: Otto, Koppers, Collin, "Kogag," Hinselmann, and others.

Certain technical innovations have been introduced in designing the new plants. In certain cases, the coal bunkers and mixers have been lined out with glass plates to enable the coal to slip down better. The coking coal towers, which hold from 4000 to 5000 tons of "fines," are remarkable features of the landscape, as they rise to heights of from 130 to 165 ft. above the ground.

The filling trucks, weighing up to 60 tons, put a weight of about 85 tons on to the roof of the oven. The accompanying sketch (fig. 1) shows the arrangement adopted at some coking

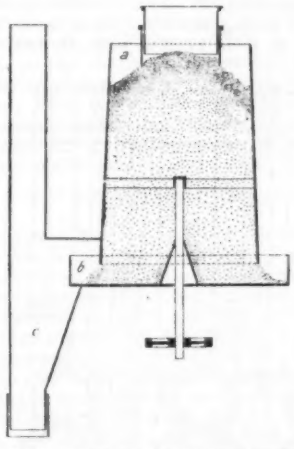


Fig. 1.—Section Through the Filling Arrangement.

plants for filling the fine coal. The coal is conveyed into the cylindrical containers *a*, the bottom of which consists of a revolving table *b* such as is used for closing coal supply bunkers. A special "stripper" discharges the coal with great rapidity; the fine coal dropping through the small guide hopper *c*, placed with an extension piece on the ring of the filler hole. Tests made have shown that filling can be performed in 90 seconds, assuming an oven of approximately 850 c.ft. capacity and coal containing 11 p.ct. of ester, and this period can be still further curtailed. This method of filling prevents the coal dropping with considerable force into the oven, and gives a gradual and easy flow.

Self-sealing doors have been introduced in most ovens. Some concerns have complained of the large amount of wear and tear and the high cost of the asbestos strips required, especially where the doors are operated by men not thoroughly skilled at the job. Another complaint concerns the large number of bolts that have to be tightened up—as many as 22 in some makes—and, in view of the heights of the present ovens, this necessitates installing special lifts for the work.

The special door raising gear, connected on the machine side with the pusher, and on the coke side with the guide shield, is usually a separate electrically driven machine. The portal type of pusher is the one mostly adopted, this weighing up to 150 tons for ovens of 19½ ft. in height.

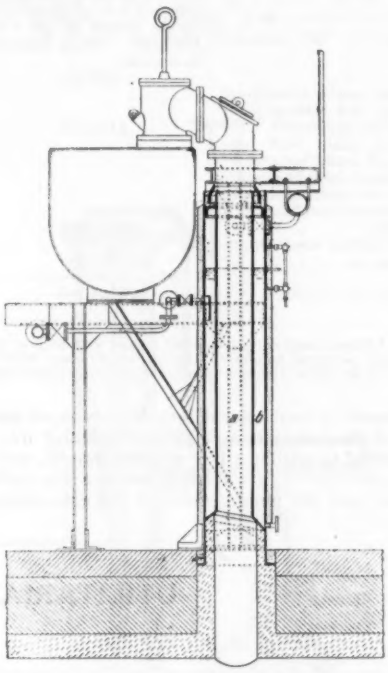


Fig. 2.—Arrangement of Water-Cooled Risers.

a = Riser; *b* = Boiler.

Wet quenching is being adopted everywhere, but the system in use enables the average water content of the coke to be kept within limits of 0·1 p.ct. The finished coke contains an average of 2 p.ct. of water. Though the dry method of quenching, with its attendant economic advantages, has not made much headway, practically every plant is equipped so that this method can be introduced later, if necessary.

A novelty introduced at one colliery for generating steam consists in water-cooled risers, of which fig. 2 is a drawing. It is estimated that this arrangement enables about 260 lbs. of steam at a pressure of approximately 114 lbs. per sq. in. to be generated from each ton of coke.

In connection with the method adopted for cooling the coke oven gas, several attempts have been made to separate the naphthalene, which is detrimental to the long-distance supply of gas. One method aims at trapping the naphthalene by directly washing the gas with cooled soft water—*i.e.*, with condensate liberated by the volatile ammonia bases. In another process, the gas is also washed with condensate, which, however, is cooled nearly to zero by the Linde process, the heat of the crude gas being utilized.

The ammonia is recovered in these new plants both by the old, indirect method, and also by the semi-direct and the Still methods. The first of these methods is the most flexible with regard to the binding medium for the ammonia bases, whereas the two latter are more economical in regard to steam consumption. The keen competition set up by the synthetic nitrogen factories compels large coking plants to produce a powdery salt containing the minimum of acid as cheaply as possible.

Special attention has been given, in designing the new plants, to the question of having gas available for long-distance supply. Most of the ovens are therefore of the compound type, arranged for heating with low-grade gas. There are four collieries in the Ruhr equipped for producing their low-grade gas from small and dross coke in special producers, thus leaving 100 p.ct. of the high-grade gas available for long-distance distribution.

A number of large coking plants have introduced mechanical recording appliances for regulating production; and, though expensive to instal, such gear is of great assistance to the management in running the ovens, and makes for greater care in operation. One noteworthy feature in some plants is the recording weighbridge set up between the coking coal tower and the batch of ovens. The filling truck has to pass over the weighbridge on each journey to and from the ovens and the coal tower, and the operator can exercise a constant check

Description.	For 1½ Million Tons of Coke per Annum.	For 1 Million Tons of Coke per Annum.	For 500,000 Tons of Coke per Annum.	For 200,000 Tons of Coke per Annum.
1. Coaling towers	£35,000	£26,250	£16,875	£9,750
2. Complete oven plant, with machine track and stacks, receiver, and exhauster equipment	£532,500	£422,500	£213,750	£85,000
3. Coking plant machines	3 pushers, 3 filler trucks, 3 door hoisting machines with hot coke guide trucks, for an output of 350 tons per hour. 1 each of above as reserves, £28,250	2 pushers, 2 filler trucks, 3 door hoisting machines with hot coke guide trucks; with no reserve. For an output of 262½ tons per hour, £24,375	2 coke pushers, 2 filler trucks, and 2 door hoisting machines; 1 each as reserve. Output, 132½ tons per hour, £18,500	1 pusher, 1 filler truck, 1 door hoisting machine with coke guide truck. Output, 55 tons per hour, £9,750
4. Mechanical coke quenching, screening, and loading plant with sorting equipment	£111,250	£83,750	£41,250	£30,625
5. Condensing plant with ammonia and crude benzole recovery plant, including buildings, electric switchgear, and administration buildings with laboratory	£322,500	£286,250	£153,750	£82,500
6. Shop and railway track equipment*	£25,750	£24,500	£17,625	£10,375
Total cost of plant	£1,055,250	£867,625	£461,750	£228,000

NOTE.—These figures apply to ovens heated with high or low-grade gas, with mechanical quenching, screening, and loading plant, condensing, ammonia, and benzole plant, including buildings. Dimensions of ovens: Width of chambers, 1 ft. 6 in.; height of chambers, 13'12 ft.; useful length, 40 ft. * Including switchgear, &c., for lighting and power, office buildings, wash-houses, and cost of levelling the ground.

on the amount of coal loaded into the ovens on each journey. It is stated that the amount of coal passing into the ovens can be checked to within a few pounds weight, and a constant check can therefore be established between the colliery supplying the coal and the management of the coke ovens.

The above table gives interesting figures of the cost of several typical large coking plants, these figures being based on the manufacturers' data.

The figures work out at 16·9s., 17·35s., 18·48s., and 22·79s. per ton of coke produced.

UTILITARIANISM IN CARBONIZATION.

By H. J. TOOGOOD.

The majority of our 1400 gas-works, being necessarily small works, and carbonization having proceeded for nearly 100 years (of the 130 years constituting the life of the gas industry) almost universally in horizontal retorts, it follows that the application of an improvement in the practice of horizontal retorting is bound to have a most beneficial effect on the efficiency of carbonization as a whole. Hence its utilitarianism.

Main Arch.—The function of the erstwhile main arch was to cheapen the cost of periodic renewals of the retorts and settings. With the improvement in refractories, the periods of repairs have become so infrequent that, coupled with the increased size of the modern setting (which relatively dwarfs the main arch), the economic phase has changed, so that it is cheaper and better to substitute a flat dead-weight bench cover for the main arch. This new departure introduces several signal advantages —viz.:

(1) Efficiency is increased; there being less mass brickwork to maintain at the modern high temperature of carbonization.

(2) Construction is economized; arch bricks being unnecessary, and cutting to suit curvatures of the arch being obviated.

(3) Individuality is given to each setting. Absence of the abutment thrust of the main arch permits the advantage of a straight open joint to render each setting independent of its neighbours.

(4) Ironwork is rendered cheaper. As there is no thrust from arches, the bench bracing is economized.

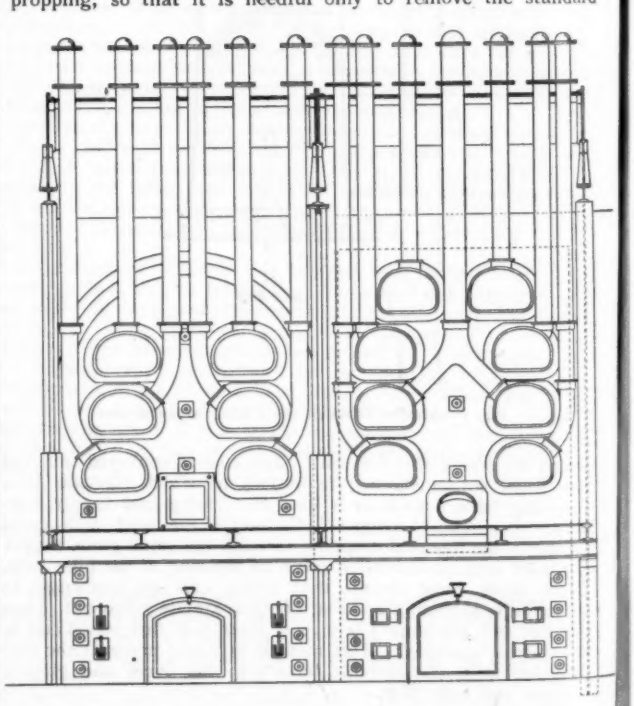
(5) The expansion of silica is absorbed. The flat bench cover simply rises exactly to accommodate growth of the interior silica mass, while always buttressing the top retorts, to work with modern stoking machinery.

Furthermore, as so frequently happens, the application of one improvement (the flat bench cover) has brought another and unlooked-for advantage to the smaller works, many of which can never seriously consider silica retorts. As is self-evident from the illustration, which shows an actual installation possessing the above advantage, the saving in brickwork is such that, by simply resetting a bed of six retorts having a main arch, a bed of eight retorts and flat bench cover are accommodated in precisely the same height and mass of brickwork, thereby giving a 33⅓ p.ct. increase in carbonizing capacity for the least possible expenditure of capital—a feature of great moment even to the smallest gas-works.

Attention is also drawn to the interesting facts that all ascension pipes are re-used; the hydraulic mains, foul mains, and tar offtakes and mains remain *in situ* and undisturbed. Hence the advantage ensues that each bed can be converted as, and when, resetting falls due.

A feature of technical interest also is that, the mass brickwork remaining the same while the retort capacity increases 33⅓ p.ct., this not only gives the economies of a larger unit to the growing gas-works, but also ensures fuel economy.

Small gas-works having recently installed flat bench cover settings, it may be of interest to consider the effect of the new flat bench cover when resetting. First, it must be realized that, with the omission of the main arch, all thrust and strain due to the main arch, or series of main arches, are likewise deleted. Hence during resetting there is no thrust to require propping, so that it is needful only to remove the standard



brick cover for replacement, strut with two pieces of timber between neighbouring beds, and then proceed with dismantling and resetting. The retort setters work in a free, light, and airy position; and thereby all the stooping and arduous effort of resetting in the dark, ill-ventilated position under a main arch are obviated.

Hence the flat bench cover results in triple economy in the standing, running, and setting charges.

SUBMERGED COMBUSTION AND THE EFFICIENT USE OF GAS.

Submerged combustion as applied to central heating and similar purposes approaches nearer ideal thermal efficiency than anything yet placed before the public. For many years the process of burning fuel and air under water has remained rather a scientific possibility than a practical industrial application. Now, however, due to work done during the last few years by Messrs. Hammond & Shackleton, of Submerged Combustion, Ltd., the process has been brought to a firm commercial basis.

It is well appreciated that in any heating process where the heat is transferred to a fluid through the medium of a boiler shell, tubes, or other container, a considerable loss of heat occurs through the limited area of contact. Hence the elaborate apparatus such as economizers and air heaters, which are used to recover waste heat from the flue gases in ordinary steam-raising practice. The restriction imposed by limited area of contact is practically eliminated when the fuel is burned in direct contact with the fluid to be heated. In the Hammond system, combustion can take place at almost any depth below the surface of the fluid. The products of combustion discharging from the submerged combustion chamber therefore pass in a finely divided form through the water; and since the mean size of the gas bubbles thus formed is somewhat in the region of one-thousandth of an inch cube, the area of contact of a cubic foot of the gas formed by combustion is enormous, and unapproachable in any form of boiler or container heated exteriorly. In steam raising, it will be appreciated that the product is a steam-gas mixture, and the water is evaporated at a reduced temperature by reason of the pressure of the steam in the boiler being, under Dalton's Law, equivalent to its partial pressure in the mixture of steam and products of combustion.

The Hammond Combustion Unit.

The successful application of submerged combustion may be credited initially to the development of the burner or combustion unit. The Hammond unit comprises a mixing chamber, a high-velocity passage, and a combustion chamber, assembled usually in cylindrical form and mounted so as to project the flame more or less vertically downwards. The whole of the combustion chamber proper is immersed in the fluid to be heated, but the mixing chamber, which is devised to give intensely intimate mixing of the fuel and the air, is not submerged. The construction of the mixing chamber effectively prevents stratification of the air and gas which is common to most injector devices, while the velocity of flow from the mixing chamber to the combustion chamber prevents any back-firing or lighting-back—a difficulty which has in the past been a serious one. With this intimate mixing the proportioning of air and fuel can approximate the ideal for perfect combustion; and by means of a specially devised proportioning valve, the proportions are maintained at any rate of combustion.

Circulatory Systems.

In systems where it is required to maintain a positive circulation of the hot water, the aerating effect produced by the previously-mentioned discharge of the combustion gases into the water performs an important function. In the Hammond apparatus it is used to aerate a column of liquid so as to cause its upward displacement by the heavier column of unaerated liquid from a portion of the body of the liquid being heated, which is separated from the zone of aeration. This circulation is intensified and controlled by surrounding the burner with a chamber having an inlet for the heavier liquid and an outlet for the rising aerated liquid; and this may take the form of an open-ended cylinder of larger diameter than the burner and surrounding the flame zone. The accompanying illustrations show the heating and circulating unit for central heating by low-pressure hot water. Fig. 1, which shows in section the Hammond central heating unit of the direct aeration type, will be readily understood by a glance at the table of references given. The burner (8), operating in the circulator chamber or air-lift footpiece (10), circulates water to the expansion tank (27), in which the water level is shown. The rising main is shown at (2), and is surmounted by head tank (17), which is maintained full of hot water by the action of the burner in heating and aerating the column of water in the riser (2). From the head tank the water flows by gravity by outlet (16), and by the superior head thus created it displaces the cold water through the radiator system, returning into the inlet (19) below. The head tank carries a deflector cover on which the rising column of hot water impinges, so that the steam and gases from combustion are separated and descend through the passage (15) surrounding the rising main, and leave the system by way of a heat exchanger in counter-flow with the return cold water from the radiators entering at (19). In this way the gases leave at the lowest possible temperature by way of the outlet (13).

The temperature of the exhaust gases determines the over-all efficiency of the system. The lower this temperature, the less the heat lost in the gases. If the water from the radiator system returns at atmospheric temperature, the discharging gases in counter-flow to it will be reduced to a temperature representing approximately 100 p.ct. efficiency for the plant. If, however, the return water is higher, there will be some slight loss, about 5 p.ct. at 122° Fahr. return water temperature. At 140° Fahr. the loss becomes only 10·1 p.ct. In the

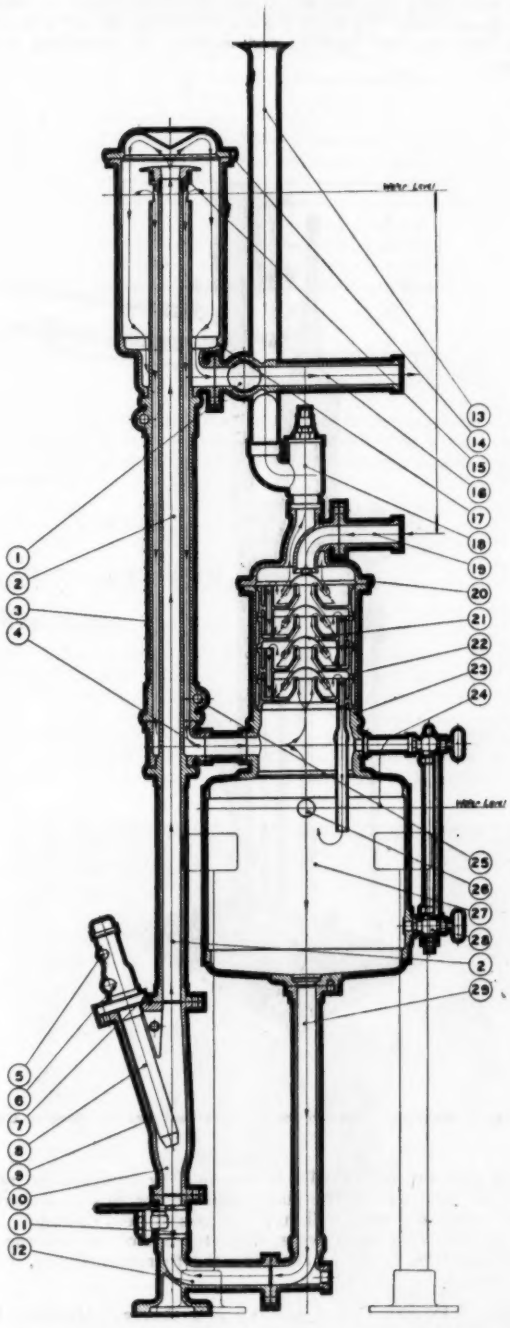


Fig. 1.—Hammond Submerged Combustion.—Central Heating Unit, 150,000 B.Th.U. Direct Aeration Type.

1. Outlet control valve.
2. Rising main.
3. Steam gas down-pipe.
4. Steam gas outlet to heat exchange.
5. Gas inlet to combustion unit.
6. Air inlet to combustion unit.
7. Combustion unit flange.
8. Combustion unit outer casing.
9. Aeration component, direct type.
10. Aeration chamber.
11. Valve.
12. Footpiece.
13. Steam gas pipe to atmosphere.
14. Head tank cover.
15. Rising main terminal.
16. Head tank outlet to system.
17. Main body of head tank.
18. Pressure regulating valve.
19. Return water inlet.
20. Heat exchange cover.
21. Perforated hood.
22. Exchange chamber.
23. Heat exchange, main body.
24. Water level.
25. Supporting stud.
26. Make-up water inlet.
27. Heat exchange sump.
28. Water-level gauge.
29. Outlet to rising main.

heat exchanger through which the gases finally discharge, the incoming return water, and any make-up water required to maintain the quantity, fall through tray sections; the steam or water vapour condensing in the cold return, and the gases leaving the apparatus at the lowest temperature of the system. This heating unit would normally be placed on the top floor of the building, as it operates by downward displacement; the circulation being created by an increased head on the heating side which displaces the water in the cold leg of the system.

The high efficiency of this system, coupled with the convenient application of gas firing, automatically controlled, makes an ideal arrangement for the central heating of large buildings. Fuel handling and storage is eliminated, as also is the consequent cleaning work associated with coal or coke for heat generation. Further, the apparatus can be put into action at a few minutes' notice, and quickly be operating at full output.

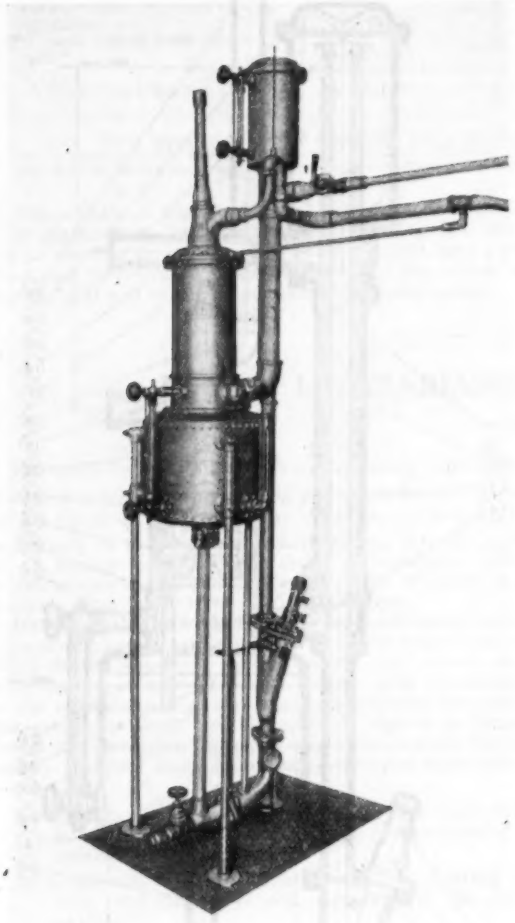


Fig. 2.—Hammond Submerged Combustion.—Central Heating Unit.

The unit shown herewith is designed for an output of 150,000 B.Th.U. per hour. The plant required for this is remarkably small compared with ordinary methods of heat raising.

The following data were extracted from the records of a three-day run, taken at random; the thermostat control being cut out.

GAS AND POWER CONSUMPTIONS FOR CENTRAL-HEATING UNIT.

The consumption of gas for heating, and of electrical power for compressing, were ascertained by records taken with the central-heating unit as the only piece of apparatus running in the test room. The latter was a semi-basement:

Cubic content	5060 c.ft.
Floor space	540 sq. ft.
Window area	75 sq. ft.

Radiators.

One "Ray-rad" panel	8 ft. by 2 ft. 6 in.
Two "Ray-rad" panels	4 ft. by 1 ft. 4 in.

One "Classic" radiator of ten 12-in. vanes.
Total radiating surface, 45 sq. ft.
Cubic feet of space per square foot of radiating surface, 112·5.

Conditions Attained at Varying Gas Consumptions.

—	I.	II.	III.
Room temperature, ° Fahr.	64·0	66·0	68·5
Outside temperature, average	47·7	46·7	42·8
Gas consumption—			
C.ft. per minute	0·552	0·717	0·971
Therms per hour	0·166	0·216	0·292
Gas and air pressure, lbs. per sq. in.	5	6	8
Electrical power consumption—			
B.O.T. units per hour	0·344	0·438	0·531
Cost at ¾d. per unit, pence per hour	0·255	0·328	0·398
Cost of gas at 8·6d. per therm	1·428	1·855	2·512
Total cost in pence per hour	1·683	2·183	2·910
With gas at 6d. per therm—			
Gas cost	0·997	1·294	1·752
Total cost	1·252	1·622	2·150
With gas at 3d. per therm—			
Gas cost	0·498	0·647	0·876
Total cost	0·753	0·975	1·274

Under normal conditions (1), supplying 0·552 c.ft. of gas per minute, with practically the theoretical quantity of air for combustion, both at 5 lbs. per sq. in. pressure, we have:

Temperature of water to radiators	137° Fahr.
,, ,, return water	128° ,,
,, ,, exhaust products of combustion	120° ,,

At this low temperature much of the water vapour formed on combustion is condensed, and its heat is added to the system.

The exhaust gases contain no oxygen and only a very small proportion of carbon monoxide.

The conditions are, then:

Per cubic foot of gas burned—	
Nitrogen	3·455 c.ft.
Carbon dioxide	0·482 ,,
Measured at 60° Fahr. and 30 in. mercury pressure—	
Gross B.Th.U. in the gas	= 501·5
Net ,, ,, ,,	= 448·1

The whole of the difference, 53·4 B.Th.U.—*i.e.*, 10·6 p.ct., of the gross value of the gas—is loss as latent heat of the water vapour from combustion on all normal systems under working conditions. In the Hammond system, with the exhaust gases at their normal temperature of 120° Fahr., saturated with water vapour, the loss by latent heat of water vapour uncondensed = 22·1 B.Th.U. = 4·4 p.ct. of the calorific value of the gas. Sensible heat = 5 B.Th.U. = 1 p.ct. of the calorific value of the gas. Useful heat recovery: 474·4 B.Th.U. = 94·6 p.ct. of the gross calorific value, and is actually 105·8 p.ct. of the net, or lower, calorific value, on which value results are often calculated.

The curve shown in fig. 3 gives these values for all temperatures likely to be met with in central heating practice, and indicates the necessity of controlling the input at the burner by the temperature of the return water.

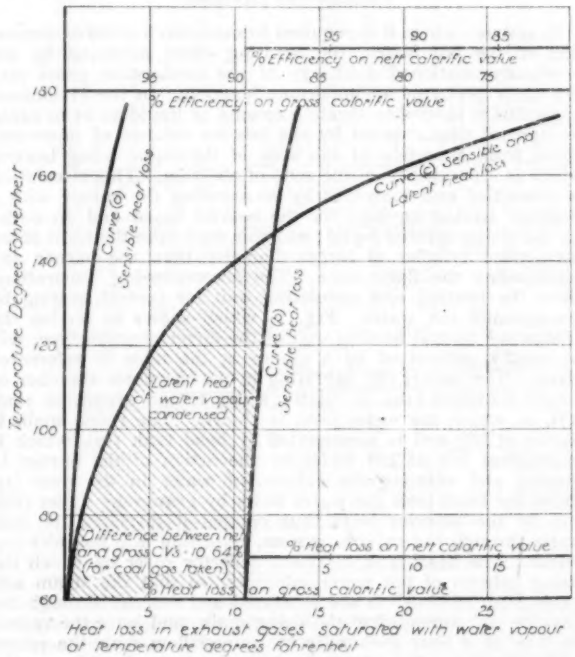

% Efficiency on nett calorific value
% Efficiency on gross calorific value
Curve (a) Sensible heat loss
Curve (c) Sensible and Latent Heat loss
Curve (b) Sensible heat loss
Latent heat of water vapour condensed
Difference between net and gross CV's - 10·64% (for coal gas taken)
% Heat loss on nett calorific value
% Heat loss on gross calorific value
Temperature Degrees Fahrenheit
Heat loss in exhaust gases saturated with water vapour at temperature degrees Fahrenheit

Fig. 3.

Adoption of the net calorific value of a fuel regards the latent heat of the water vapour in the products of combustion as

irrecoverable. Calculating the sensible heat losses, at various exhaust temperatures, on this basis, we have the curve (*a*). But this basis, though often adopted, is not a true one, and in its relation to the true—that is, to the gross—calorific value, the curve of sensible heat loss should occupy the position (*b*).

Submerged combustion on the Hammond system, by intimate contact of the products of combustion with the water to be heated, couples rapid and complete heat transfer with an extremely low exhaust temperature. In a central heating unit this exhaust temperature is from 5° to 8° Fahr. below the temperature of the return water from the radiators.

Condensation of the water vapour in the products of combustion, with recovery of its latent heat, takes place. The curve of true loss of heat, both latent and sensible, is shown in (*c*). The shaded area shows recovery of latent heat by condensation of water vapour in the exhaust.

It is seen that more than 100 p.ct. of the net heating value of the fuel is recovered at the exhaust temperature normal to central heating units on the Hammond system. That the net value gives a false basis is then manifest. That it is, nevertheless, often employed must be remembered when comparisons are made.

Normally, the input at the burner would be reduced on the return water reaching 120° Fahr. for the mixed class of radiator in use. Where the equipment is of the radiant panel type throughout, the thermostatic control is set to operate at 80° to 90° Fahr., for in the radiant type of heating a large area is employed, and in the best practice the mean temperature of the radiating surface should stand at about 120° Fahr.

Fig. 4 is reproduced from an actual section of the chart from the "Mono" duplex continuous CO_2 and CO recorder, and shows an average of 12·4 p.ct. of CO_2, which is the maximum obtainable, and an average CO reading of less than 0·5 p.ct. This average condition has been maintained for twelve months. In addition to being an indication of perfect combustion, it also shows the absence of surplus air.

The influence of the submerged flame upon the alkalinity or acidity of the circulating water is seen from the fact that water of an original *p*H value of 8·0 on the completion of a twelve months' run now shows a *p*H value of 6·5, so that it may safely be said that there is no material tendency for the water in a Hammond central heating system to become acid. Corrosion, therefore, is not to be feared, as is borne out by the condition of the pipes and radiators when these are dismantled for examination.

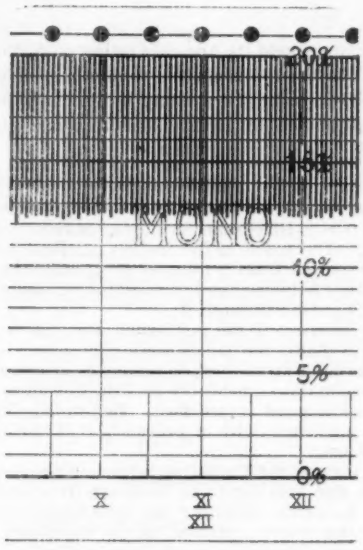


Fig. 4.

LONG SERVICE AWARDS AT HULL.

Presentation of Silver Cups.

An interesting function took place in the Lecture Hall at the Prospect Street Showroom of the Hull Station of the British Gas Light Company, Ltd., on Thursday afternoon last, when, on behalf of the Directors of the Company, the Chairman and Managing Director, Mr. Henry Woodall, presented eighteen officials, including five pensioned officials, with silver cups in recognition of their long and faithful service with the Company. The cups are replicas of a well-known beautiful old Irish cup.

The presentations were made in the following order, and the total number of years' service rendered by each official is shown in parentheses:

John Young, late Engineer and Manager of the Hull Station (37).
William Lovatt, late Chief Clerk (58).
John Robert Warren, late District Superintendent (50).
Alexander Allan, late Assistant Engineer (39).
William Winn Strawson, late Cashier at Works (40).
Charles Gorwood (52), Alfred Smith (47), Albert Wood (39), John William Purnell (35), Herbert Lawton (32), Samuel Middleton Purnell (29), John Charles Procter (28), Arthur Moore (27), Edward Scholey (26), John Harness (26), Robert William Mingay (26), David Robert Hughes (26), and John Cotton (25).

Mr. WOODALL stated that it was more than a pleasure to him to make the presentations, and that he had a feeling of real gratitude to the eighteen gentlemen who were receiving cups that day when he realized that between them they had served the Company for 650 years. It was a record of which they had every reason to be proud. Mr. Woodall said that he would not weary them with statistics of the undertaking, but would simply remark that it was one which had grown steadily, and was to-day in as good a financial position as ever it was in its history of over a hundred years. [Applause.] He pointed out that it was their custom to give a certificate to all those who served the Company continuously for 25 years, and that in the case of the workmen the certificate was accompanied by a present of £5, but that up to the present there had been no addition to the certificate in the case of the staff. The Court of Directors had decided that this was not quite fair, and in future all members of the staff would receive, in addition to the certificate, one of these cups suitably inscribed.

Mr. HAROLD E. COPP, Engineer and Manager, proposed a hearty vote of thanks to Mr. Woodall, and said that it was always a very great pleasure to see the Chairman at the Hull Station. On behalf of all those present he wished to express sincere thanks to the Chairman for coming down from London to make the presentations. The idea of presenting these beautiful cups was a characteristically gracious action on the part of the Directors.

Mr. JOHN YOUNG, O.B.E., in seconding the vote of thanks, said that he was not one of those who, having ceased to act for the Company, had ceased to take an interest in its progress. In all their business lives, the employees were constantly receiving tokens of the kindness of their Directors, and, as Mr. Copp had already remarked, the presentation of these cups was only another instance of their many kindnesses.

After the presentations were made, tea was served.

It is an interesting fact that since the first presentation of Long Service Medals and Certificates in 1912, no fewer than 463 have been distributed. Those who have received medals include Directors, officials, and workmen at all Stations of the Company, as well as at the Chief Office in London.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

Visit to Dundee.

The Association held its Annual Outing on Saturday, June 1, at Dundee. In the morning, the parties met at the West and Taybridge Stations, and, travelling by specially reserved tramcar, were conducted to Lytton Street, where they inspected Messrs. A. G. Kidd's new bakery.

The bakery is reputed to be one of the finest and best equipped in Scotland, and includes a Baker Perkins gas-operated travelling oven by Keith-Blackman for baking morning rolls, cookies, and biscuits. The speed of the endless platform or floor of this oven may be varied from 3 minutes to 55 minutes per journey. It was said that between the hours of 4 a.m. and 6 a.m., 12,000 morning rolls passed through it.

While the interest of the gentlemen was taken up with this section of the plant, the ladies were conducted over the sweet and chocolate making section, wherein, as at other parts of the works, the up-to-date machinery and the cleanliness of the processes created a good impression. Before leaving, each lady visitor was presented with a pound box of the firm's freshly made chocolates.

Mr. R. J. GAVIN, the President, in moving a very hearty vote of thanks to the firm for their kindness in allowing the visit, and to Mr. Laurence Kidd for the way he had conducted the parties over the works, referred to the excellence of the plant and the methods of ensuring good clean food, which, he thought, must have a beneficial effect on the people of Dundee.

Mr. L. KIDD made fitting reply, and the visitors then travelled by tram to Kidd's Restaurant, where they were received by Bailie Leslie, Convener of the Gas Committee, Mr. Jas. Dickson, Engineer and Manager, and Mrs. Dickson, and were entertained at lunch by the Corporation.

Bailie LESLIE referred to the pleasure it gave him to welcome the Scottish Juniors to their city. He felt sure that the visit would be helpful to members and friends. Associations of this kind were conducive to progress in industry. In concluding, he wished the visitors a most enjoyable day, and he hoped that they would go home with splendid recollections of the holiday in the Jute City.

Mr. GAVIN, in reply, said that he was sure they would spend a delightful day. The weather conditions and the arrangements so far had favoured them. Bailie Leslie, he said, had given them evidences of the enthusiasm of Dundee as a gas centre. The Association, in the past, had received considerable support from Dundee, and Mr. Dickson was ever ready to encourage the Juniors. He had on the occasion of the 25th Anniversary Dinner in December last provided a most informative address on the early history of the Eastern District Association. With such assistance from the Seniors, the Association would always be in a flourishing condition.

The visitors then proceeded, by specially chartered Corporation omnibuses, round the city, making calls at several of the Council housing areas, at each of which gas appliances for domestic purposes are installed. At the Logie housing scheme, it was noted that this was formally opened on May 27, 1920, by Sir W. Don, K.B.E., and was the first scheme in Scotland to be proceeded with by a local authority.

A halt was made at the Law Hill, an outstanding Dundee landmark, upon the summit of which, 570 ft. above ordnance datum, stands the Dundee War Memorial, visible for many miles around, and so equipped that it may serve as an effective beacon in the night. Mrs. Dickson placed on the Memorial a wreath from the Association "In memory of the lads who fell," while the visitors stood in silence for two minutes.

From the top of the hill, the view of the River Tay, Dundee, and the surrounding country is beautiful and extensive. An indicator in the form of a dial shows the direction in which one may look for the distant bens and great mountain peaks of the West.

The visitors then drove to Broughty Ferry, where games of bowls and putting were arranged on the Council-owned greens. Visitors not taking part in these or the golf match went on to the sands, a magnificent stretch of which constitutes the chief glory of the "Brighton of the North."

LONDON JUNIORS AT WORTHING.

A party of some 150, including ladies, attended the summer outing of the London and Southern District Junior Gas Association to the Worthing Gas Light and Coke Company on Saturday, June 8. The major part left Victoria Station at 9 a.m., though some preferred to take advantage of a road trip to the coast. Arriving at the works at 11 a.m., they were received by the Vice-Chairman of the Company, Mr. J. G. Denton, in the unavoidable absence of the Chairman (Mr. William Cash). With him were Mr. S. O. Stephenson (Engineer to the Company), and the following members of the staff: Messrs. T. Wood, A. E. Matthews, and E. Taylor.

The members proceeded to make an inspection of the works, of which the following notes give a brief description.

The Worthing Gas Company was first formed in the year 1835, the works being built on the present site. The first year's consumption was, apparently, less than one million c.ft. In 1900, the make of gas was 114 million c.ft.; in 1914, 206 millions; and for the year 1928, 405 millions; while for the current year, 1929, it shows every indication of reaching the 450 million mark.

Unfortunately, though the Company possesses a fairly large piece of ground, only a narrow strip is scheduled for manufacturing purposes. As a result, coupled with the phenomenal growth and the necessity of enlarging the works from time to time on this cramped site, the lay-out is not ideal. No claim is made for any special feature of interest about the works, save an exemplification of the axiom that the principal qualification of an engineer is an ability to overcome difficulties.

CARBONIZING PLANT.

All retorts are horizontal—Gibbons' regenerative settings—and stoked with Guest-Gibbons machines. The electric current for supplying the power for these and the coal handling plant is obtained from the Corporation electricity works.

There are two retort benches, as follows: (*a*) Six arches with settings of eights, 23 in. by 16 in. by 20 ft., giving a total production of 750,000 c.ft. per 24 hours; and (*b*) six arches with settings of tens, 24 in. by 18 in. by 20 ft., giving a total production of 1,250,000 c.ft. Two of these arches are being set this year, completing this installation.

There is also a ½-million c.ft. carburetted water gas plant by Humphreys & Glasgow, Ltd. The productive capacity, therefore, comprises 2 million c.ft. per 24 hours. It may be noted that the output on one day in February last exceeded 2½ millions.

There is a 1-million c.ft. per day water-cooled condenser; and a new one of double that capacity is being installed this year. There is a 1-million c.ft. per day Livesey washer and an old ½-million Cockey washer. The latter is now being taken out to be replaced by a 2-million apparatus. There are two tower scrubbers.

The engine room contains a Waller steam engine and exhauster of 125,000 c.ft. per hour capacity, and one of 60,000 c.ft. The latter is being displaced this year by a machine similar to the first named.

There are also two gas compressors, one with a vertical and one with a horizontal steam engine, for driving the gas to the gasholder at Goring. One of these compressors is connected so that it can be utilized for boosting gas to the town. The purifiers comprise two sets (dry lutes). One set of four boxes 40 ft. by 22 ft. by 5 ft. 6 in., has Weck centre valves. The station meter is of the rotary type. There are two holders at the works—one of 320,000 c.ft. capacity and one of 180,000. Each has three lifts, the top being a flying lift. The larger of the two is at present under repair, the middle lift being reconstructed. There is also a three-lift holder at Goring, three miles away, of 750,000 c.ft. capacity. The total storage capacity is 1¼ million c.ft.

There are two Lancashire boilers of 30 ft. by 8 ft. 6 in. and 28 ft. 6 in. by 8 ft. respectively, each working up to 120 lbs. steam pressure. They supply steam for the whole of the works, including the water gas and sulphate plants. Other features are a Botley plant for the elimination of naphthalene and tar dehydration, and sulphate of ammonia plant.

After the inspection, the visitors were entertained by the Directors at luncheon, but, owing to the large number, they had to go in two parties to the Steyne Hotel on the Marine Parade. The first party was presided over by Mr. Denton, who was supported by Mr. W. J. Liberty (Past-President).

Mr. DENTON expressed his pleasure at seeing so many members of the Association present. On behalf of the Chairman (Mr. William Cash), who was unavoidably absent, and the Directors, he extended to them a very hearty welcome to Worthing and to the Company's works. He trusted that their visit to the works had proved of interest to them. Though the works were not large, he hoped the members had been able to learn something which would prove useful to them in their occupations.

Mr. LIBERTY said that without moving any formal resolution, he

would express their thanks to the Directors of the Company for their kindness to them that day, especially mentioning Mr. Denton, who had presided over that section of the luncheon. Mr. Denton was well known in Worthing, having been chosen no fewer than four times by the burgesses of the Borough to be their Mayor. He was also in the unique position of being the only Freeman of Worthing, having had that honour conferred upon him for services rendered to the Borough.

On the second party assembling for luncheon, the chair was taken by Mr. Stephenson, who was supported by the President, Mr. W. Trevor Kenshole (Lea Bridge), Mr. Walter Grogono (Engineer to the Croydon Gas Company; Past-President), and Mr. L. Lacey, Past-President.

Mr. STEPHENSON said he was glad to see so large a number of the London and Southern Junior Gas Association members present that day with their friends. Thirty years ago the output of the Worthing works was mainly a lighting load, and often after the morning work, in common with other similar sized works at that date, the Engineer had nothing else to do for the remainder of the day. However, he (the speaker) got 50 or 60 cookers installed, and, in spite of the prejudice and erroneous statements of that day—that the odour of the gas in cooking permeated the food—they pushed on, successfully proving by demonstration that it was impossible to tell after the cooking of a dinner whether it was cooked by gas or not. Then came gas fires, and since then they had enjoyed continuous progress.

The PRESIDENT stated that it was a privilege that day to visit the works of the Worthing Gas Company, and it was their business as gas engineers and salesmen to note many things of interest on a works on a very restricted space indeed, and which since 1914 had 100 p.ct. increase without any decrease in efficiency. The Worthing Company certainly had a remarkably up-to-date purifying plant, and were able to deal with their own tar dehydration, and dispose of the whole to the Local Authority for road purposes.

Mr. F. S. LARKIN (London; Junior Vice-President) proposed a hearty vote of thanks to the Chairman, Mr. Denton, the Directors, and Mr. Stephenson for their kindness in opening their works to them that day and for their generous hospitality.

Mr. J. H. GOLDSMITH (South Suburban Gas Company) seconded the vote.

Mr. STEPHENSON replied, and thanked the members for their complimentary remarks. They were a happy family at Worthing, and all worked well together.

Mr. DENTON said that the Directorate had to consider the consumer and the shareholder; and if they had a contented consumer they naturally had a contented shareholder.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to Wigan Coal and Iron Company's Kirkless Works.

On Wednesday, June 5, members of the Manchester and District Junior Gas Association assembled at Wigan Railway Station and were conveyed to the Kirkless Works of the Wigan Coal and Iron Company. On arrival, the party were welcomed by Mr. Shaw (Coke Works Manager) on behalf of the Directors. Messrs. Entwistle, Turner, Winstanley, and Allen acted as guides.

One of the items of interest was the battery of 132 waste-heat coke ovens of the "Semet Solvay" type, each oven taking a charge of 5 tons of wet slack; the coking period is about 22 hours. The length of the oven is 33 ft., the height 6 ft., and the width 15 to 17 in., the yield of gas being approximately 11,000 c.ft. per ton of dry slack. The yield of tar is about 7 galls.; benzole 3 to 3¼ galls., sulphate of ammonia 24 lbs. (neutral); and the coke made is approximately 400 tons per 24 hours. The tour round the tar works was very interesting. The stills have a capacity of 25 tons each, the mixer being of the same capacity. The products are refined tar, light oil, creosote oil, naphthalene, &c. Some time was spent at the blast furnaces, where the members saw a run being made of ferro manganese. The present output is 60 tons per day, and they cast every 8 hours. The blast pressure is 4 lbs. per sq. in. The three turbo-blowers and one turbo-generator were very much admired, and called forth many complimentary remarks and expressions of surprise.

Mr. Abbott, the Works Manager, and Mr. Whittaker, Assistant Works Manager, neither of whom had been able to accompany the members round the works, were present at tea, and acted as hosts on behalf of the firm.

Mr. H. C. APPLEBEE, A.I.C. (Vice-President), called upon Mr. C. H. BAMBER (Bolton) to move a vote of thanks to the firm; and the vote was seconded by Mr. G. W. BROUGHTON (Haslingden).

Mr. ABBOTT, in his reply on behalf of the Directors, said that their bye-products plant was equal to anything they would see in the country, and some day they hoped to be able to say the same of their ovens. They had hopes that they would be dealing with gas in bulk. Germany was at present dealing with gas over distances as great as 200 miles.

Mr. SHAW (Coke Works Manager) supported Mr. Abbott in a few words.

THE PLASTICITY OF COAL: ITS MEASUREMENT AND ITS VALUE IN THE SELECTION OF COALS FOR CARBONIZING.

By J. A. JACKSON, of Bolton.

The plasticity of coal is its property of fusing when subjected to progressive heating. Fusion occurs over a range of temperature determined primarily by the nature of the coal. Continuation of heating results in solidification.

The property of fusion or plasticity of coal is the foundation on which the coking industries have been built up. Hence an accurate knowledge of this property is essential to those engaged in industries concerned in the manufacture of coke, either as a primary product or as a bye-product. The importance of the plastic property is generally appreciated, but the value of being able accurately to compare the plastic properties of various coals does not appear to have received due attention in the gas industry.

The coke oven industry, having for its object the production of a uniform coke, has, particularly during recent years, felt the need of some means of comparing or measuring plasticity. It is obvious that where different coals are used the quality and uniformity of coke can be controlled by the selection of coals possessing similar or complementary coking properties; and to do this with minimum expense, a means of estimating coking properties in the laboratory is essential.

W. A. Forbes in the "Proceedings of the American Iron and Steel Institute" states:

> The coking property of coal varies with different kinds of coal; it varies with coal from the same seam, and it varies with conditions arising in actual coking operations. It is well known that, even in coals of practically the same analysis, the coking property is not necessarily even approximately the same. Determinations of the melting-point, or plastic stage, of the coal have been made. By plotting these results and comparing them with the physical quality of the coke, a definite relation was found to exist between them. By adjusting the carbonizing temperatures of the ovens, it was found that the physical properties of the coal were immediately improved, indicating that the coke quality had been actually improved by a knowledge of one of the coking properties of coal—its melting-point.

Most of the work done on the measurement of plasticity has been carried out by chemists engaged in coke oven works, so that damage to ovens by excessive swelling pressure may be avoided and the quality of the coke improved.

Experimental work is being carried out having for its object the production of an oven coke which not only is uniform, but does not develop fissures in the process of manufacture. This work is based on a knowledge of the plasticity of the coals employed. In the gas industry, particularly where verticals are used, a knowledge of plasticity will become more and more important. Not only is ease of working such plant attainable by due regard to the plasticity of coal, but the quality of coke may be controlled by this means.

Possibly the simplest method of examining the softening properties of coal is to place a small quantity of coal in a crucible heated to bright redness. The speed at which fusion occurs throughout the mass, the gas evolution, and the swelling afford a rough means of comparison.

W. B. Davidson in his book "Gas Manufacture" states:

> Many coals give trouble in verticals, especially continuous verticals, by reason of their plasticity under heat treatment; and it is sometimes important to know the temperature at which coal begins to soften, the range at which it is most plastic, and the temperature at which it begins to harden.

G. E. Foxwell, in his investigations on the travel of gas through the coal charge in a coke oven, realized the importance of a knowledge of plasticity. He devised a very ingenious means of determining the plastic range. Briefly stated, the method is to heat coal in a silica tube at a definite rate of 5° C. increase per minute. Gas from a reservoir is passed through the coal at a rate of 20 c.c. per minute per sq. cm. area of coal. The gas pressure required to effect this is not further altered. Pressure, read on a sensitive gauge at the inlet to the tube, gradually rises. The flow of gases falls off as the coal passes through the plastic stage, and recommences as coke is formed. Those coals which produce hard cokes give the highest resistance, while gas coals give less, and non-coking coals still less.

It has been used in England and America in coke oven works, where it has given useful information. It differs from other methods in that it has as its basis the back-pressure thrown by molten coal to the passage of a stream of gas.

The agglutinating value or caking index of coal serves as a good means of controlling coking operations where coals of similar properties are used—for instance, coals from the same district. It has failed, however, in the comparison of coking properties of coals from different areas.

Charpy and Durand, having for their object the production of improved coke in coke ovens, have also interested themselves in the measurement of plasticity. Their method consists of moistening coal with water, and moulding into cylinders 35 mm. long. The cylinders are dried at 105° C. and placed in a glass tube of very slightly larger diameter. A short glass rod placed on the cylinder acts as a pointer, moving up or down the tube as expansion or contraction occurs. The tube, thus prepared, is placed in a copper casing and heated in a bath of lead. At a certain temperature, varying according to the sample and the rate of heating, the cylinder undergoes a contraction, which reaches a maximum and then ceases. Continuation of heating causes the molten coal to swell. The increase in volume is sometimes considerable, but finally ceases, and is followed by a second contraction characteristic of true coking. The authors take the melting-point to be the temperature corresponding to the maximum of the first contraction.

E. Audibert, working on somewhat similar lines, uses a cylinder of coal 60 mm. long and 6 to 7 mm. in diameter. The coal, of a definite degree of fineness, is slightly moistened with water, and compressed in a mould to an exactly measured density. The coal cylinder is placed in a copper or iron tube supported vertically, and a counterpoised glass road rests on the briquette. The furnace consists of a bath of alloy or other material, electrically heated.

Audibert points out that, whereas Charpy and Durand considered the melting-point of coal to be at the initial contraction, this contraction is due to the molten coal flowing into the space between the walls of the vessel and the coal cylinder. He draws some very interesting conclusions from his work. He states that the fusion of coal is not a sharp fusion, as in the case of a pure compound, but each coal melts over a range of temperature. This supports the assumption that the organic matter of coal is a mixture of several compounds. After the actual softening of the coal, and previous to solidification, there occurs a phenomenon which Audibert calls "intumescence." This is simply an increase in volume. The expansion characteristic of intumescence is due to the formations of gas bubbles in the plastic mass. It is very probable that those bubbles are due to the decomposition of the fusible constituents of coal.

Coal having been melted always solidifies again, whatever heat treatment may be adopted; but if the rate of heating is not sufficiently quick, fusion may not take place, owing to decomposition of the fusible matter proceeding rapidly relative to increase in temperature. So that before the melting-point of the coal has been reached, the whole of the fusible constituents have been destroyed. Intumescence is only an apparent expansion due to evolution of gas.

A study of the work of previous workers leads to the conclusions that the melting-point of coal is dependent on the nature of the coal and the rate of heating.

In the investigation of fusion, the rate of heating is of great importance. Considerable difference in the melting-point of a given coal may be observed by employing widely different rates of heating. The more rapid the heating, the lower the melting-point.

Apparatus.

To study the plasticity of the coal, the following apparatus has been devised. It consists of a vertical tube of transparent silica in which is placed a briquette of the coal under examination. Outside this is another silica tube, also transparent, wound with resistance wire. This tube acts as the heating element, and to prevent sagging of the wire, when heated, two rows of small pieces of silica are fused along opposite sides. The heating tube is surrounded by a wide glass tube which functions as a heat insulator. The briquette of air dried coal, weighing 2 grammes and measuring 0·5 in. long, will just slide into the inner tube, where it rests on the junction of a thermo-couple. On top of the briquette rests a glass or silica pointer. Small differences in the pressure employed in compressing the coal into a briquette do not appear to affect results. No binder whatever is used.

The rate of heating is controlled by a sliding rheostat graduated along the slider-bar. This is not ideal but is probably the best means to be obtained at a reasonable cost. It is necessary to determine by experiment what movement of the rheostat per minute will give the desired rate of heating, which is an increase of 10° C. per minute. This permits the actual determination being concluded in about one hour. The experiment is conducted under vacuum.

During heating, a very gradual expansion occurs up to the point of fusion. In all the coals examined this has been less than $\frac{1}{20}$ in. When fusion occurs, a sudden expansion takes place. Expansion proceeds rapidly until plasticity ceases. Subsequent heating produces a gradual shrinkage. The following table gives results typical of those obtained, using this apparatus under the experimental conditions specified above:

Results.

Coal.	Melting-Point.	Plastic Range.	Expansion.	Ash.	Moisture.	Volatile Organic Matter.
	°C.	°C.	P.Ct.	P.Ct.	P.Ct.	P.Ct.
A	415	50	220	6·34	0·75	35·35
B	..	..	..	17·11	1·07	33·83
C	470	30	20	6·38	5·45	35·73
D	475	25	120	3·65	2·28	33·40
E	470	20	20	7·17	2·23	31·98
F	440	31	80	8·88	1·30	31·53
G	320	..	..	..	..	..
H	450	33	130	3·20	1·93	33·87
I	450	16	40	10·42	2·52	33·33
J	425	25	35	6·37	2·75	34·87
K	445	35	80	4·72	2·25	35·71
L	462	58	260	5·27	1·34	33·29
M	465	..	..	11·50	1·29	32·96
N	461	..	..	9·42	1·92	32·48

A is a Lancashire coking coal.
B is a non-coking coal.
C, I, and J are coals which work very easily in vertical retorts.
H may be described as a moderately easy working coal.
L, M, and N are different samples of the same coal, containing different percentages of ash.

Conclusions.

(1) Melting-point and plastic range are characteristic of the coal.

(2) To compare softening properties of coals, it is imperative that standard conditions be employed, particularly as regards rate of heating. Figures for melting-pot and plastic range are of little value unless the conditions of determination are quoted. The extent of decomposition prior to fusing varies with different rates of heating; the consequence being divergent values for plasticity.

(3) Oxidation of coal, if carried sufficiently far, renders coal infusible. Partial oxidation by exposure to air, up to a point does not appear to affect the melting-point, but it does reduce the plastic range and the expansion. (See results L and O.) Within limits variations in ash content similarly affect the plastic range and the expansion, but not the melting-point.

(4) There is no real contraction when coal melts. When heated, coal displays a very slow expansion up to its melting-point. On melting, expansion proceeds rapidly until decomposition causes solidification. Coals easily carbonized in verticals are those of low plasticity range and small expansion; while those of a high plastic range and large expansion give trouble, being more suitable for coke ovens. The coals most desirable for vertical retorts, therefore, will be those as low in plastic range and expansion as will give the desired quality of coke. This statement must be qualified to some extent by considerations of size of coal. A fine coal gives rise to greater working difficulties than does larger coal of exactly the same plastic range and expansion.

Stages in the Coking of Coal.

The coking of coal falls naturally into three stages.

(1) Preliminary period during which moisture and occluded gases are given off. Some decomposition also occurs shown by the evolution of volatile matter. Slow rate of heating during this period diminishes coking properties.

(2) Plastic period. The coal fuses and rapid decomposition sets in, involving evolution of gas. Tiny bubbles of gas become enclosed in the viscous mass, causing expansion. During this period the viscosity of the mass decreases to a minimum, and then increases until the mass becomes solid, forming a semi-coke.

(3) A final period during which gases are still given off containing an increasing percentage of hydrogen. During this period, which has considerable bearing on the qualities of the coke, shrinkage of the mass occurs, shown by fissures in the finished coke.

It seems probable that the time, during plasticity, at which decomposition, with its consequent evolution of gas, is most marked determines to some extent the nature of the coke. If gas evolution is greatest at the time of minimum viscosity, then a fluffy weak coke will be formed. Let us consider coal of this type carbonized under conditions which prevent swelling. The bubbles of gas are able to pass from the centre of the mass and approach the surface, being enclosed in a thin film of liquid of low viscosity; these bubbles, on encountering the retort walls, burst, and only a slight pressure is exerted on the walls of the retort. If, however, gas is evolved most rapidly when viscosity is higher, then a stronger and less swollen coke will result. The gas bubbles enclosed in the mass are not so free to move as in the previous case; consequently the mass must swell as a whole. If swelling is restricted, then a considerable pressure is exerted on the retort walls.

It has been assumed in the above theory of pressure exerted by the fused mass that decomposition occurs at one point more

than another. If we assume that decomposition with gas evolution occurs at a uniform or nearly uniform rate during plasticity, then the free expansion may merely be an indication of the average viscosity of the molten mass.

P. Damm attributes the differences in strength of coke to the presence in coal of two constituents: An oily bitumen, capable of fusion, which is responsible for the coking properties; and a solid bitumen productive of swelling. The two constituents may function independently of each other. Damm ascribes to the different quantities and natures of these constituents the failure of the agglutinating value or caking index to give a true indication of coking properties.

It may be convenient to state here the two main theories of the fusion of coal:

(1) That coal contains small quantities of one or more fusible constituents which on heating melt, and decompose at a temperature higher than their melting-point. These constituents, if present in sufficient quantity, on fusion flow into the interstices between the coal particles, and serve to bind the whole mass together.

(2) That the whole organic matter of coal is fusible, and that in the plastic state coal contains only one phase.

Each of the two theories has gained many adherents. The first, supported by the fact that extraction of coal by organic solvents leaves a non-caking residue, is probably the better known.

Practical Considerations.

The three stages of coking previously mentioned occur side by side during carbonization in a horizontal retort or coke oven. The centre of a partly carbonized charge represents the preliminary heating period, and very little gas is given off by this portion of the charge. Entirely surrounding the unchanged coal is a region of plastic coal which varies in thickness according to the plastic range of the coal. Decomposition is proceeding rapidly here, and a considerable volume of gas is being given off which has a fairly free passage through the third band or stage, represented by the semi-coke being gradually converted into normal coke. Foxwell has shown that the plastic zone is resistant to the passage of gas; but, as in the case of a stationary charge the amount of gas to pass through it is only that from the practically undecomposed coal, this is unimportant. The gas from the plastic stage has to flow outward through the rapidly forming coke which, Foxwell again has shown, offers less resistance to gas flow than the plastic coal. The gas from the plastic zone is augmented by that from the semi-coke in the final stage of heating. Thus in horizontal retorts and coke ovens the gas is given off with minimum resistance to its travel.

Carbonization in a continuous vertical retort is a very different matter. Coal enters the retort from a hopper and descends continuously at a regulated speed, finally emerging at the extractor as coke. The temperature of the retort walls varies from top to bottom according to the type of plant. The gases travel upward. At all times there is cold coal entering the retort, and coke leaving. Steam admitted at the bottom of the retort serves the double purpose of cooling the coke and producing water gas. A condition of equilibrium is set up controlled by the speed of throughput, the heats carried, and the nature and size of the coal entering the retort. As the coal encounters the hot walls of the retort, it rapidly passes through the preliminary period, and becomes plastic. As the heat conductivity is low, this process does not proceed in a horizontal plane. The coal nearer the centre of the retort does not become plastic until it has passed farther down the retort. It can be seen that this process proceeds until the plastic zone has bridged over the retort in the form of an inverted cone. The length of this cone depends on the factors mentioned previously; and provided working conditions do not vary, it will always be the same for a given coal. Below the cone of plastic coal there is a semi-coke which is converted into high-temperature coke by the time it reaches the bottom of the retort.

The thickness or depth of the plastic zone—*i.e.*, the distance separating the unchanged coal from the semi-coke—depends primarily on the nature of the coal. If the coal has a low plastic range, then the zone will be thin; if the coal has a high plastic range, then the zone will be of greater thickness. For a coal of low melting-point the plastic zone as a whole will be nearer the top of the retort; whereas with a high melting-point coal the zone will be lower.

We have seen that in a stationary charge such as a coke oven charge, gas is given off with the least possible resistance to its passage. In a vertical retort this is not the case. The upper part of the charge in the preliminary stage of heating gives off freely the small amount of gas typical of this stage. Also, gas from the plastic zone, in which decomposition is proceeding rapidly, is able to pass through the cold coal easily. We now come to the gas from that portion of the charge below the plastic zone. Whatever may be the proportions of gas given off by coal in its three stages of carbonization in a vertical retort, the amount of gas from the charge below the plastic zone, augmented as it is with water gas and undecomposed steam (all of which has to pass through the plastic zone), must be very considerable. This is being investigated in a continuation of the present work.

The passage of all this hot gas through the unchanged coal has undoubted advantages, but its passage through the plastic coal has disadvantages. Considering the case of a coal of low plastic range, we find that the disadvantages are small. In a continuous vertical retort the charge does not actually move uniformly downwards. It remains stationary for a time, and then drops a few inches. This is always occurring; and it can easily be seen that, when the zone of fused coal is thin, each time a drop occurs the zone will be broken in places and a free passage offered to the gas flow for a short space of time. Breaks in the zone, however, will be quickly filled in, and the passage of gas again obstructed. While this is the case the gas will actually have to be forced through the molten coal; and it seems probable that this will have a detrimental effect on the coke produced. In the case of a coal of higher plastic range, that zone of molten coal may never be broken, and the continuous passage of gas through a thick band of fused coal can only result in an open coke with large pores. The only means of avoiding this is to take off the gas from the charge in the final stage of carbonization below the plastic zone.

In conclusion, the coke oven industry, by paying attention to the choice of coal having suitable coking properties, and the modification of carbonizing conditions to suit the coals carbonized, have obtained an improved and more uniform product for metallurgical purposes. The use of gas-works coke covers a wide range of industries as well as the domestic field; and to obtain maximum efficiency and give general satisfaction, the type of coke best suited to each particular case must be studied. Screening of coke into different grades is not sufficient to meet all requirements. It is possible that by careful attention in the selection of coals to their plastic properties, and by studying the carbonizing conditions best suited to each particular coal, definite types of coke could be produced. Further, this would result in improved working conditions, increased range of markets, and a better product, and would permit of the utilization of a wider range of coals.

Discussion.

Mr. H. B. Knowles (Lancaster) moved a vote of thanks to the author of the paper, and said that the subject was one that was not very generally studied by the gas industry as a whole, and he thought that in the near future the industry would have to go further into the question of coal blending.

Mr. J. Carr (Stretford) seconded the vote.

Mr. J. T. Haynes (Bolton) complimented the author, and remarked that Mr. Jackson had done this work in his own time and quite apart from his duties at Bolton.

Mr. Applebee also spoke in support of the work done by Mr. Jackson, who, he said, had been a very able student at the Manchester College of Technology.

Mr. W. P. Smith (Bolton) said that the figures given for coals, which the author stated gave satisfactory results in vertical retorts, were very illuminating. They had a low plastic range coupled with a low expansion. This would be a valuable guide for the future purchase of coals for use in verticals. The original theory that all the gas in a vertical retort passed through the cold coal and acted as a distilling agent had been discarded. The idea that most of the gas passed up the sides of the retort did not, however, cut out the necessity of its passage through the plastic zone where it touched the sides of the retort. With a sticky coal, the difficulty of the passage of gas through the plastic zone was indicated by pressure at the bottom of the retort.

Mr. J. Albinson (Manchester) asked if, when two coals of different plastic properties were blended, the plastic properties of the blend bore any relation to those of the original coals.

Mr. Jackson, in reply, stated that this was the objective of blending.

Mr. Parry (St. Helens) asked if the author had done any research to ascertain the mode of travel of the gases in a vertical retort. The conditions of heating the experimental briquette were standardized. These conditions did not occur in practice, as they were regulated by the demand for gas. In view of this, was the information gained of any practical value?

Mr. Jackson replied that mainly theoretical, but unpublished, work on a large-scale experimental plant tended to bear out his conclusions. It was only by the use of standard experimental conditions that relative values could be assigned to the coking properties of various coals. Thus by correlating these results to actual practice, it became possible to choose coals which would give ease of working, combined with the production of suitable coke under the carbonizing conditions prevailing.

Apprenticeship in Engineering.—Dr. H. Schofield, the Principal of Loughborough Technical College, who spoke upon "Education for Responsibility in Industry" at the Faculty of Teachers in Commerce Conference on May 20, said that boys on leaving schools were inclined to be more critical when considering what steps they should take in laying the foundation of their career. One result had been to re-open and revivify the question of apprenticeship, and he believed definite steps had been taken in the matter of re-introducing some type of *bona fide* apprenticeship in the engineering industry. The nation should realize that, in expecting the young worker to continue his education in his spare time, they were setting too severe a task before him. The wasteful process of sacrificing the 95 p.ct. in order to take the super-cream of 5 p.ct. which came out on top was altogether too inefficient.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Working Results at Oxford.

Sir,—With reference to the discussion and your editorial comment on my paper, it is apparent that some explanation is required as to how the figures in Table No. 1 under the column "Per Meter" are arrived at.

I quite agree that a therm in the foul main is precisely the same as a therm in the consumer's meter. The British Thermal Unit is a definite and theoretically a perfectly simple unit to understand; but to obtain the average number of therms produced in the gaseous state from a ton of coal over a period is by no means a simple matter if any degree of accuracy is required. In presenting the two sets of figures I do not suggest that the actual number of therms produced from a ton of coal varies with atmospheric conditions, but the method of obtaining every-day records will vary considerably.

Calorific value figures of gas are always understood to be B.Th.U. per c.ft. at 60° Fahr. and 30 in. (moist) gross, but many undertakings do not correct the volume shown by the station meter for temperature and pressure conditions. At these undertakings the "therms per ton" figure is obtained by multiplying the meter reading by the average calorific value, and I have inserted this figure in the table under the heading "Make of Gas in Therms per Ton of Coal Carbonized per Meter." My object in doing this was to show engineers who do not correct for temperature, and barometric and meter pressures, the amount of correction in my case, bearing in mind that published test figures are always fully corrected.

In presenting a paper before the Institution, however, it was necessary to correct the gas volume as fully as possible. In our case the average temperature over the period was 57° Fahr., the barometric pressure was 29·9 in., and the pressure at the inlet of the meter was 0·8 in. mercury, resulting in a correction multiple of 1·031, which is applied, of course, to the volume only. Thus the meter make of 14,930 c.ft. at 57° Fahr. and 30·7 in., when corrected, increases to 15,396 c.ft. at 60° Fahr. and 30 in. moist. The C.V. in the latter case is still 485 B.Th.U. per c.ft., giving a true thermal yield per ton of coal of 74·66.

As I have stated, the make of gas is seldom corrected in the daily or yearly records. Possibly the reason for this is because in many undertakings it would add somewhat unfairly to the unaccounted-for gas. In our case the addition would be approximately 3 p.ct. unless, of course, a correction was made to the gas volume registered by the consumers' meters.

In presenting this paper, I endeavoured to show the results obtained at Oxford with modern horizontals over eighteen months' working. I have not seen published any results from vertical installations which are other than comparatively short tests. It would be helpful to those called upon to make a decision upon the selection of plant to have results over an extended period giving similar comprehensive details.

W. E. Caton, M.Inst.C.E.,
Engineer and Manager.

Oxford Gaslight and Coke Company,
York House, St. Aldate's,
Oxford,
June 15, 1929.

REGISTER OF PATENTS.

Gas Meters.—No. 310,155.

Smith, E. W., and Smith Meters Ltd., both of Kennington Park Road, S.E. 11.

No. 8346; March 19, 1928.

This invention relates to dry gas meters of high capacity employing a connection between the two usual flag rods and their pivot valves which includes an arm on each rod acting through links and a tangent to rotate a crank coupled by valve arms to the valves for working same over their plates.

The primary object of the invention is the provision of proportionately large capacity per revolution; and the patentees have found that particularly good results are obtained by combining with a meter of the kind above mentioned diaphragm discs of the type adapted to pass completely through the usual rims to which the diaphragms are attached. The invention consists in this combination, including pivot valves which are actuated from the flag rods.

Atmospheric Burners.—No. 310,162.

Yates, H. J., of Grosvenor Place, S.W. 11, Howlett, M., & Co., Ltd., of Birmingham, and Dolphin, J., of Hampton-in-Arden.

No. 8796; March 23, 1928.

According to this invention for atmospheric burners, the air controller comprises a tubular ring or sleeve adapted to slide within the open end of the burner tube and having openings or ports in its walls for the admission of air into the burner tube; the sleeve being adjustable endwise of the burner tube so as to cover the air admission ports to a greater or lesser extent, the adjustment being effected by a screw. The latter preferably passes through a lug on the sleeve and screws into a lug on the burner tube.

A further feature of the invention is to slit that part of the screw which enters the lug on the burner tube and to spring the parts of the screw apart so that they grip the threads of the lug.

Gas Ring.—No. 310,206.

Parkinson Stove Company, Ltd., and Gibb, D. M., both of Stechford.

No. 14,169; May 14, 1928.

This invention provides a design of ring specially adapted for the dual purpose of boiling a kettle and heating an elongated article such as a curling or a soldering iron.

Automatic Control of Gas Stoves.—No. 310,239.

Kurth, H., and Kauffmann, K., both of Hanover.

No. 20,854; July 18, 1928.

This invention relates to a gas stove of the kind provided with a spring-controlled burner head adapted to maintain the gas valve open under the weight of the cooking vessel and to close it on the weight being reduced owing to the evaporation of the boiling liquid. The object is to provide means for easy adjustment of the spring pressure to suit vessels of different weights; and the invention consists in the provision of a spring support in the form of a bell crank having a long arm which takes the thrust of the spring and a short arm which bears against a headed adjusting screw whereby the lever can be turned about its fulcrum.

Meters.—No. 310,281.

Taunton, R. P., and McIndoe, R. W., both of Birmingham.

Patent of addition to No. 274,631. No. 33,963; Nov. 20, 1928.

This invention relates to a modification of patent No. 274,631 [see "Journal," Vol. 179, p. 451], which described a liquid seal for use with rotary or oscillating shafts in gas meters. In that arrangement the shaft passes through a sleeve having its extremity in contact with the inner end of an inverted cup member whose lip is sealed in liquid in an outer cup or cylinder.

The object of the present invention is to improve the construction of this type of seal, by which still greater efficiency is obtained without imposing any retardation on the rotating or oscillating shaft. According to the invention the annular shoulder on the inverted cup member is formed with an inclined upper face, and the gland nut which secures the inverted cup in the main cup is correspondingly cut, to form with the shoulder a ground joint which effectively prevents the liquid in the sealing cup from leaking to the outside when the seal is inverted for any reason. A further feature consists in providing the sleeve with a cupped or dished base screw-threaded on its exterior for engagement with a screw-thread in the lower part of a cylinder, forming the main cup member or box for the seal.

Lubrication of Gas Meters.—No. 310,669.

Wilson, J. H., of Baginton.

No. 13,746; May 10, 1928.

This invention has for object to ensure that so long as the meter is in active operation an adequate quantity of lubricant shall be supplied automatically and positively to the various working parts of the mechanism.

The invention involves the provision, preferably within the meter casing, of a reservoir for the lubricant in bulk and one or more pumps adapted for operation directly or indirectly by or from some suitable part of the existing internal mechanism of the meter; the arrangement being such that each pump draws lubricant from the reservoir and forces it under pressure along suitable pipes or conduits direct to the required points.

The patentee points out that the invention is particularly appropriate to the lubrication of the bellows leathers, in which case it is important, in view of the fact that the open ends of the tubes project into the measuring chambers, to provide some means for preventing the escape of unmeasured gas. It is necessary therefore to provide some form of non-return valve.

Where it is desired also to supply grease to the stuffing boxes and other bearings, the reservoir may be divided into two compartments, one for grease and the other for oil, each compartment having its cam and pump or pumps. Subsidiary claims show that the pumps may be driven from the cross-shaft or from the flag wires of the meter, as may be the cam shaft in the event of reciproating pumps being used.

Water Heating by Gas.—No. 311,441.

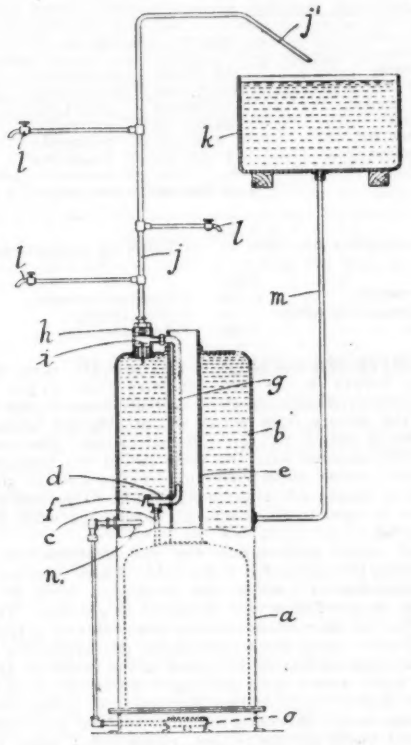
BARRALET, T. E. and J. H., and NEW GEYSERS, LTD., all of City Road, E.C. 1.

No. 4289; Feb. 10, 1928.

This invention relates to apparatus for heating water by gas which will operate either as a geyser for giving an immediate and unlimited supply of hot water to any connected tap, or as a circulation system for heating the contents of a storage tank.

The invention will be clear from the drawing which we reproduce, and from the following description of the operation of the apparatus.

With the burner *o* in operation, water heated in the geyser *a* rises through the geyser outlet pipe *c* into the tank *b*, while cold or partially heated water is supplied to the geyser from the lower portion of the storage tank *b* around the lower edge of the partition partially separating the water spaces of the geyser and tank. Now should there be no demand for hot water at any of the taps *l*, the water in the storage tank *b* will circulate through the geyser; the temperature of the water being raised to the point where the thermostat *n* (when such is employed) reduces the supply of gas.



A Barralet Water-Heating Combination.

On the other hand, should hot water be drawn off from the system at one of the taps *l*, the hot water from the geyser passes by way of the pipe *g* directly from the pipe *j* supplying the taps; the tendency of the cooler water in the lower part of the tank *b* to flow through the horizontal limb of the **T**-piece *d* causing the light flap valve *f* to close and prevent such flow. It will be understood that the valve *i* will not open, or will open very slightly, when the water in the upper part of the tank *b* is cold or slightly warmed, owing to the higher velocity of the hot water flowing from the geyser through pipe *g*, but that when the water in the upper part of the tank is hot the valve *i* will open to allow the water to flow into the pipe *j* and intermingle with the hot water supplied from the geyser. When the demand for hot water ceases, the valve *i*, when such has opened, closes automatically and the valve *f* opens under the pressure of the flow of hot water from the geyser outlet pipe *c* into the tank *b*. It will be understood that the pipe *g* may be carried up outside or inside the storage tank *b* as required, while in some cases it may be advantageous to construct the storage tank and geyser as entirely separate elements connected by suitable piping.

Conveying and Quenching Coke.—No. 311,487.

JENKINS, W. J., & CO., LTD., of Retford, and GOODMAN, R. M., of Victoria Street, S.W. 1.

No. 6225; Feb. 28, 1928.

According to this invention, coke discharged from retorts is conveyed down a travelling inclined or anti-breakage chute into a fixed channel member or trough extending in a direction parallel with the face of the retort bench, and a stream of water flowing along the channel is caused to quench and carry away the coke to means which separate the coke from the water and transfer it to a place where it is intended to grade, store, or load the coke.

In one way of carrying out the invention the travelling inclined chute is arranged to receive the coke from gas retorts disposed at different heights in a retort bench; the object of the chute being to prevent breakage of the coke. The channel or trough into which the coke is directed may be constructed of any suitable material, and is normally covered with a series of hinged doors. The bottom of the trough, which might be curved, is inclined towards the discharge end, and a stream of water is caused to flow along this trough in sufficient volume to carry away the coke at the same time as it is being quenched.

Water for quenching and conveying the coke may be delivered to the inlet end of the trough by a pump or any other form of water motor, or by a gravity supply. At the discharge end of the trough, the coke and water are received by some means whereby they are separated. In one form, a tray conveyor with perforated plates to allow the water to drain off might be used. An elevator, or conveyor, or drag-bar conveyor might also be used.

A tank or tanks of sufficient capacity is or are provided to deal with the water, and such may each be divided into several compartments, the water passing from one to the other in order to allow the small coke or any other foreign matter to separate out before the water is finally either sent to waste, or utilized again for feeding the inlet end of the trough.

Cluster Burners.—No. 311,522.

PARKINSON & COWAN (GAS METERS), LTD., of Kennington Road, S.E. 11, CHEW, J. H., of Blackpool, and HOBSON, H. A., of Birmingham.

No. 10,602; April 10, 1928.

The invention comprises the employment of annular or equivalent groups of inverted incandescent mantles arranged at different levels, and the provision of means whereby one or more of the groups can be put out of action when a light of less intensity than the maximum is required.

In one form three groups of inverted incandescent burners are situated close together. The upper and largest group is attached to the underside of a hollow ring by which gas is supplied to the individual nozzles. At a lower level is arranged a smaller intermediate group of inverted mantles. These may be carried on another ring or a system of hollow radial arms extending from the central member. The mantles in the second group may be supplied with gas from the same pipe as the first group, or they may be supplied independently from another pipe. Beneath the intermediate group is arranged the third and smallest group of mantles; these being carried upon a shaped hollow member which is attached to a vertical central pipe to which gas is supplied either independently of, or from the same source as, one or both of the other groups. The gas pipes supplying the different groups are provided with suitable cocks so that any one or more of the groups can be put into or out of action as required.

To minimize oxidation and tarnishing of the metal surfaces of the parts carrying the nozzles on which the mantles are mounted, the said parts are metalized by spraying with aluminium or other suitable protective coating.

Atmospheric Burners.—No. 311,583.

RADIATION LTD., of Aston, and YATES, H. J., of Grosvenor Place, S.W. 1.

No. 17,897; June 20, 1928.

Introducing this invention, which relates to atmospheric gas burners used for gas fires, the patentees say that usually the gas jet which supplies gas to the open end of the horizontal mixing tube is arranged with its axis horizontal. Further, it is sometimes customary to enclose the upper side of the space between the gas jet, or nipple, and the open end of the mixing tube by a hood. Due to the presence of the hood air can only gain access to the mixing tube from the sides and beneath the tube. The stream of air is therefore unsymmetrical with the axis of the gas jet, and in consequence a tendency is set up to deflect the gas stream upwardly from its proper horizontal direction. This condition has formerly been dealt with by an invention (Patent No. 241,699), according to which a suitable initial downward direction was given to the gas stream. Experience with this invention proves that while it successfully solves the problem for which it was intended, its use is accompanied by a practical difficulty, in that manufacturing conditions do not enable the position of the nipple (or inclination of the gas stream) to be determined easily with sufficient accuracy.

The object of the present invention is to enable the same problem to be solved more easily by other means; and for this purpose the invention comprises the formation of the inlet and of the mixing tube with an upwardly deflected passage, the contour or disposition of which compensates for the effect of the hood over the upper portion of the gas stream and permits the use of the usual nipple which is arranged to impart an initially horizontal direction to the gas stream.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 29.]

Nos. 15,654—16,200.

BURCH, F.—"Gas, water, &c., meters." No. 15,683.
EVANS, E. G.—See Burch, F. No. 15,683.
FRANCIS, W. R.—"Deflector plates for gas cookers." No. 15,806.
GENERAL GAS APPLIANCES, LTD.—See Francis, W. R. No. 15,806.
TRENT PROCESS CORPORATION.—"Simultaneously carbonizing coal." No. 15,726.

MISCELLANEOUS NEWS.

BOROUGH OF NELSON GAS DEPARTMENT.

Annual Report.

The Engineer and General Manager of the Borough of Nelson Gas Department (Mr. James Mitchell) submits the following 10th annual report for the year ended March 31. The expenditure on revenue account during the year has been £103,201, or £1402 more than the estimated expenditure; while the income has been £106,809, or £8254 less than the sum estimated. The result is a gross profit of £21,116, and a net profit of £3608.

During the year, 29,055 tons of coal have been carbonized; 25,984 tons at the Brierfield Works, and 3071 tons at Nelson. The total wages paid during the year amounted to £27,845. The total wages paid during the previous year amounted to £27,729. The number of men employed by the Department has varied from a maximum of 178 to a minimum of 169, while last year the number varied from 177 to 167.

Residuals and Bye-Products.

The gross income from residuals and bye-products has been £17,360, as compared with £20,601 obtained the previous year, and, after deducting all the expenses of manufacture and handling of same, the net income from this source amounts to £13,453, as compared with £16,775 last year.

The total quantity of gas delivered during the year has been 585,366,000 c.ft., being an increase of 9,205,000 c.ft., or 1·6 p.ct. on the quantity delivered last year. As compared with last year, ordinary meters show a decrease in consumption of 6,611,000 c.ft., or 2·97 p.ct.; prepayment meters a decrease of 1,798,400 c.ft., or 0·64 p.ct.; making a net decrease by meter consumers of 8,409,400 c.ft., or 1·67 p.ct. Street lamps show an increase in consumption of 6,855,300 c.ft. as compared with last year; shop lamps a decrease of 623,500 c.ft.; and the gas consumed in the works is decreased by 676,300 c.ft.

The unaccounted-for gas has increased by 12,067,800 c.ft., and now stands at 5·17 p.ct. of the total quantity of gas made, as compared with 3·14 p.ct. last year. Most of this increase in lost gas is attributable to a number of fractures in mains during the recent spell of severe frost.

The maximum daily consumption was 2,669,000 c.ft. on Monday, Dec. 10, 1928, and the maximum weekly consumption was 16,389,000 c.ft. for the week ended Dec. 23, 1928.

There are now a total of 16,949 consumers; 6620 of these have ordinary meters, and 10,329 are provided with prepayment meters—an increase of 186 consumers during the year. The average consumption per ordinary meter was 32,559 c.ft., and per prepayment meter, 27,000 c.ft.

The number of street lamps within the Borough is now 1546, and of these 951 are situated in front streets and 595 in back streets. The gas consumption of these lamps amounted to 44,720,200 c.ft., compared with 43,029,800 c.ft. consumed last year, an increase of 1,690,400 c.ft., or 3·92 p.ct.

During the year, 491 gas cookers, boilers, fires, radiators, &c., have been sold for cash amounting to £1491. In addition, 611 appliances to a value of £3652 have been disposed of on the three, six, and ten years' hire-purchase system. The total number of cookers, boilers, and fires on simple hire is now 5826, the year's installations numbering 283, compared with 805 last year. A very satisfactory feature is the growing popularity of various types of water heater, 194 having been fixed since March, 1928.

New services laid to property amounted to 208; and 509 defective house services have been renewed. In addition, repairs to 1380 defective services have been carried out.

Maintenance, Repairs, and Renewals.

Considerable progress has been made during the past year in the gradual reorganization and extension of the Brierfield Works. The existing carburetted water gas plant, of small capacity and obsolete design, has been completely dismantled, removed to a new site, remodelled on the most up-to-date lines, and re-erected. The re-designed plant has an increased capacity of approximately 100 p.ct.

The installation of the "Michell" crankless compressor was completed early in the year. Plans for the conversion of the sulphate of ammonia plant to the manufacture of concentrated liquor, and for the reorganization of the coke handling plant, are well advanced, and it is hoped that both schemes will shortly be in operation.

An application for borrowing powers to the extent of £12,000 was recently made to the Ministry of Health in connection with a new Livesey washer (capacity 4 million c.ft. per day), waste-heat boiler to work in conjunction with the Brierfield carbonizing plant, and reconstruction of the Brierfield station meter and carburetted water gas plant. The formal sanction for the loan has now been obtained from the Ministry, and the necessary work is being proceeded with.

The estimates for next year allow for an increased income from gas sale equal to 9 p.ct. at present prices. The total expenditure on revenue account is estimated at £76,381, and the total income at £113,102. After deduction of income-tax, interest, and sinking fund charges, a net profit of £19,811 is expected, to meet the various items in the appropriation account.

BLACKBURN GAS DEPARTMENT.

Annual Report.

The Engineer and General Manager of the Corporation of Blackburn Gas Department (Mr. G. P. Mitchell) has submitted his report on the progress of the Department during the year ended March 31 last; and the following is an extract.

The total quantity of gas made was 1,142,330,000 c.ft., being an increase of 19,610,000 c.ft., or 1·75 p.ct., over last year, and was registered as follows:

—	1926-27.	1927-28.	1928-29.
Ordinary meters	468,776,000	460,808,500	477,984,500
Prepayment meters	500,273,100	477,671,000	482,154,700
Industrial purposes	37,780,000	39,314,000	47,620,900
Public lighting	44,958,600	52,316,800	53,662,100
Works, offices, &c.	9,322,000	11,113,000	9,833,600
Unaccounted-for	85,570,300	81,496,700	71,074,200
	1,146,680,000	1,122,720,000	1,142,330,000

The consumption has been in the following proportions:

	P.Ct.		P.Ct.
Ordinary meters	41·84	Prepayment meters	42·21
Industrial meters on rebate	4·17	Public lighting	4·70
Gas-works	.0·86	Unaccounted-for	6·22

Comparing the financial years ended 1920 and 1929, the number of ordinary meters in use have increased from 13,691 to 15,913, while prepayment meters shows a decrease from 22,897 to 21,316, and industrial meters from 66 to 64, making an increase in the total number of meters during the period of 660. The average consumption per consumer over the same period has increased for the three types of meter respectively from 25,659 c.ft. to 30,037 c.ft.; 14,105 c.ft. to 22,619 c.ft.; and 418,988 c.ft. to 744,076 c.ft. The price of gas in 1920 was 4s. 10d. per 1000 c.ft., while the present price is 3s. 6d.

The total wages paid during the year amounted to £48,487, equal to 10·9d. per 1000 c.ft. of gas sold. Extra men are employed in the preparation of ground and foundation work for the new boiler house, &c., which is now in course of erection. The sales of appliances for the year amounted to a total value of £17,793. Over a period of nine years, more than 22,000 gas appliances have been sold, the consumption having increased to the extent of 314¼ million c.ft., or 41 p.ct., with a corresponding extra receipt in revenue.

The coal used in carbonization amounted to 57,695 tons; an increase of 2094 tons. Working results have been well sustained, as shown by the yields per ton: Gas, 19,804 c.ft.; coke, 9·24 cwt.; sulphate of ammonia, 21·60 lbs.; and tar, 15·84 galls.

Financial Results.

The total expenditure on revenue account was £151,840, against £174,493 for the preceding year, while the income amounted to £220,687, leaving a balance of £68,847 gross profit for transfer to net revenue. After meeting sinking fund charges, &c., there remains a net profit of £14,530 for appropriation. It is of interest to note that, though the Department in the past ten years has incurred expenditure of capital to the extent of almost £300,000, yet the difference is no more than £5437 on the amount of debt outstanding. Sinking fund contributions and interest charges have advanced from £35,463 to £55,167, an additional annual amount of £19,704.

A re-assessment of the undertaking has again been made, the amount having been advanced to £24,000, as against £19,000.

INCREASED SALES AT ARBROATH.

A Satisfactory Year's Work.

The past year's working of the Arbroath Gas Department shows a gross profit of £8461.

In his report to the Town Council on June 10, the Gas Manager (Mr. A. C. Young) stated that to the sum mentioned had to be added the balance carried forward from the previous year, amounting to £30. After the sum of £8354 had been paid towards sinking fund, contingency, and depreciation account, there would be a credit balance of £137.

The gas produced during the past year totalled 193,827,000 c.ft.—an increase of 2,802,000 c.ft.; and the gas sold, *less* street lighting, was 179,139,100 c.ft.—an increase of 2,281,817 c.ft.

The gas sold for street lighting totalled 5,995,000 c.ft., an increase of 527,583 c.ft.

The coal used during the year totalled 12,281 tons, being an increase of 199 tons; and the price paid for coal was £1 0s. 8d.

per ton, a decrease of 1s. 6d. per ton compared with the previous year.

The Council approved of the decision of the Gas Committee to reduce the price of gas for the current year from 3s. 2d. to 3s. per 1000 c.ft. to ordinary consumers, and from 3s. 6d. to 3s. 4d. to prepayment meter consumers, the existing allowance for gas engines and discounts to be continued.

BARROW-IN-FURNESS GAS DEPARTMENT.

Annual Report.

At the Barrow-in-Furness Town Council meeting on Monday, June 3, Councillor Bettinson, in moving the adoption of the Gas and Water Committee minutes, referred to the report for the year ended March 31 last, and mentioned the very satisfactory increase of business that had taken place.

To begin with, the output of gas had shown a very steady and pleasing increase, resulting in a total of 15,620,000 c.ft. more than the previous year, equivalent to 4·6 p.ct. Most of this had been taken by slot meter consumers which indicated that there was an increasing demand for gas for domestic purposes, and the Committee's policy of re-organizing the distributing system by the laying of larger trunk mains was enabling this demand to be met. The Hindpool main was completed in July last, and the new 18-in. and 12-in. gas mains in the Roose district were connected up in March. The beneficial effect of this latter work was reflected in the return for the first month of the current year—namely, April, when the total quantity of gas sent out was 2,600,000 c.ft. in excess of that of the corresponding month of the year under review. It would also be noted that 106 new consumers had been added, and 122 additional cookers placed out on hire.

WORKING RESULTS.

No difficulty had been experienced during the year in obtaining satisfactory supplies of coal, all of which have been drawn from the Yorkshire coalfields. There were 26,821 tons carbonized, as compared with 24,720 during the preceding year, 25,457,000 c.ft. more coal gas having been produced. Owing to an improved demand for coke, it was not found necessary to work the carburetted water gas plant to the same extent as in 1927-28, as was shown by the fact that some 9½ million c.ft. less carburetted water gas was turned out, resulting in 101 tons less gas oil being required. With regard to the accounts, after setting aside the sum of £11,211 for renewal of works and plant, the gross profit for the year amounted to £15,260. Interest and sinking fund contributions absorbed £15,173 of this, leaving a net profit of £87, as compared with £9177 for the preceding year. It would be remembered that the price of gas was reduced as from Oct. 1 last from 4s. 3d. per 1000 c.ft. to 3s. 9d.—a reduction of 6d. per 1000 c.ft. In consequence, the amount received from the sale of gas was less by £4016, notwithstanding the increased output to which he had referred. Tar and ammoniacal liquor produced £2198 less, the market prices for tar having fallen by 28s. 6d. per ton during the year. Coke produced £272 more than the previous year, while sulphate of ammonia was better by £352.

Regarding the expenditure side, coal cost £1467 more; repairs and distribution, £137 more; rates and taxes, £4047 more; management and establishment, £143 more; and renewals contributions, £345 more; while decreased expenditure had been incurred in respect of oil and coke, £1269; manufacturing costs, £776; public lamps, £227; and loan charges, £386.

The sum of £1473 had been spent on capital account during the year in respect of mains, services, public lamps, meters, and stoves. The aggregate of the gas capital account was £265,249, of which £152,250 had been repaid, leaving £112,999 still outstanding. At the beginning of the year there was a surplus in the Gas Department of £4348, to which the net profit of £87 was added, leaving a net surplus, £4435, to be carried forward to the current year's accounts.

The report was approved along with the recommendation in connection with the financial working of the Gas Department, that as from April 1 last all new meters and stoves purchased by the Committee be charged to the renewals fund instead of to the capital account.

MALTA AND MEDITERRANEAN GAS COMPANY, LTD.

The Ordinary General Meeting of the shareholders of the Company was held at the Offices, 59-60, Gracechurch Street, E.C.3, on Tuesday, June 11. Mr. A. M. PADDON, M.Inst.C.E., Chairman of the Directors, presided.

The SECRETARY (Mr. C. J. Daun) read the notice convening the meeting, and the certificate of the auditors.

The CHAIRMAN, in presenting the Directors' report (which showed that, after appropriating the sum of £3000 to reserve, the amount standing to the credit of profit and loss was £25,402), said he thought the statement which it was the duty of the Directors to submit that day would on examination be found to be a satisfactory one. Supervening on many similar accounts antecedent to it, it yet bore a favourable comparison to that which was last put before the shareholders. The subsidiary figures conducing to this result differed very little from those of a year ago. But in so far as these differences occurred, they were to the advantage of the present accounts, and in the aggregate they constituted a very important improvement in the condition of the Company. On the credit side of the accounts, they had sold something like 2½ p.ct. more gas—not an unsatisfactory figure from their point of view—and the sale of gas had produced £965 more. The rental of meters, stoves, and fittings, as ancillary to that sale, had brought in £374 more than a year ago. There had been a slight reduction in the receipts from residuals, because, although this was a very remote situation, they did respond in sympathy to general markets throughout the world. However, it was gratifying to reflect that to-day, as compared with twelve months ago, residuals were advancing in value rather than receding. On the other side, coal, oil, and coke cost £1290 less, and the maintenance, renewals, and general improvements of the works came to a sum of £1350 less. Notwithstanding that reduction, there had been expended during the period under review something like 2s. for every 1000 c.ft. of gas sold for maintenance and improvement; and the works could not deteriorate very much if this money was intelligently expended, as he thought it was. The profit was increased by over £4000; and this, he was sure, the shareholders would regard as a very satisfactory outcome of the operations. Looking at the profit and loss account, the balance which they carried forward was increased by £3177, after there had been transferred to reserve the sum of £3000. Going to the balance-sheet, it would be seen that the investments on behalf of the undertaking, in Government and Bank of England Stocks, stood at £90,205, which was an increase as compared with a year ago of nearly £10,000; while the actual valuation of that amount at date was £94,515. Comparing actual values with actual values, this was an increase of just under £9000, so that there had been a trifling deterioration on previous investments.

THE PROSPECTS.

Now as to prospects of the current year. These did not seem quite so good as the details they had been reviewing. Coal was slightly dearer; but they had bought all the coal for the current year's trading, with the exception of one month's supply, so that they knew where they stood, and the increase in price in their case was comparatively trifling. What he had said about residuals had its application in this regard, and he did not think they need fear any material further setback. One of the great advantages of the Company was the high standard of efficiency which prevailed. It was a small undertaking, and, of course, it was very difficult to get the highest standard from a company making 100 million c.ft. a year. Anyone who examined the accounts, however, must recognize that the efficiency in the case of the Malta Company was of a very high standard. That this high standard had been reached, and was being maintained, was greatly to the credit of their executive officers. With regard to Malta itself, they were told by their representatives out there that there was now a full military and naval establishment. In other words, the 1914 condition of things had been re-established, and this was as much as they could reasonably hope for. Since the war, things had not got back to the normal state which was reported at the present time. This, of course, was in their favour. Then there was some move towards making the island a health and pleasure resort. It had undoubtedly increased in favour as a port of call and as a temporary place of residence for the people in the Mediterranean. Another pleasing feature was that the relations of the Company with the Government were as amicable as in the past. Altogether, therefore, he did not think they need have any apprehensions about the future; and he trusted that, when the next meeting came round, if the Directors had not quite so good an account as the present to give to the shareholders, they would come fairly close to it.

Mr. A. W. OKE formally seconded the motion.

The CHAIRMAN, replying to a shareholder, said he did not think the ordinary population of the island was increasing. There was some building going on, both public and private; and, of course, the Company watched this very closely. For many years things had been stationary, but now there was a distinct move forward. The total number of cooking stoves on hire was 1765, which was considerable for a Company of that size. In addition, there were a great many cookers privately owned. During the year 26 cookers and 20 geysers were sold, and over 200 other pieces of apparatus. Altogether there were 900 geysers in use.

The report and accounts were then unanimously adopted.

AN INCREASED DIVIDEND.

On the proposition of the CHAIRMAN, seconded by Mr. STRACHAN C. CLARKE, a dividend was declared at the rate of 5 p.ct. on the ordinary shares, making, with the interim dividend, 9 p.ct., free of income-tax, for the year; also a dividend of 3½ p.ct. on the first preference shares and 3¾ p.ct. on the second preference shares, less income-tax.

The CHAIRMAN pointed out that this brought the dividend to a higher point than heretofore; but the Directors would not recommend it unless there was a prospect of being able to maintain this standard of distribution.

The CHAIRMAN proposed the re-election as a Director of Mr. F. Harding Jones, M.Inst.C.E. He said that anyone of Mr. Jones's experience and accomplishments was a very valuable asset to a Company of the kind.

Mr. E. L. BURTON seconded the proposition, which was agreed to.

On the motion of Mr. F. W. CHURCH, F.C.I.S., seconded by Mr. W. H. DAUN, the Auditors (Messrs. William Cash, F.C.A., and Hyde C. Burton, A.C.A.) were re-elected.

The CHAIRMAN proposed a hearty vote of thanks to the officers in London and abroad for their services during the past year. He said this vote was very well deserved. All the officers had served the Company most loyally and effectively.

Mr. J. MITCHELL seconded the vote, which was cordially passed, and suitably acknowledged by the SECRETARY.

The Chairman and Directors were thanked for their services, on the proposition of Mr. CHURCH.

BURST MAINS.

Recommendations of Committee Set Up by the Surveyors' Institution.

The following recommendations of the Special (Burst Mains) Committee of the Surveyors' Institution, set up, under the Chairmanship of Mr. E. J. Silcock, "to consider and report upon the causes of the frequent explosions and bursts in mains under roadways which have recently occurred, and to suggest protective or preventive measures against their occurrence," have been adopted by the Council.

1. Additional powers are required by local authorities to control the laying of all underground mains and conduits within their areas by undertakers.

2. The operations of statutory undertakers should be co-ordinated so that when road surfaces and foundations are being re-made, or on other suitable occasions, the existing mains may be laid or re-laid under the supervision of, and conditions prescribed by, the local authority.

3. Where any works of excavation are about to be carried out, the local authorities should be empowered to satisfy themselves as to the mode of excavation, and that the elimination of voids, filling-in, and consolidation of the soil, are properly carried out.

4. Abandoned sewers, water and gas mains, and other disused conduits, vaults, and chambers, forming potential reservoirs for the collection of gas, should be broken down and filled in.

5. In the body of this report* reference has been made to the non-existence of adequate statutory regulations to enforce the taking of proper precautions with regard to the use of lights, &c., in underground conduits and excavations. In considering the preparation of such regulations, the departments concerned might find those now operating for similar purposes in connection with mines as providing a useful precedent.

6. Mains and pipes have been frequently made of indifferent and untested materials, and, particularly in the case of some gas mains, the quality of the material and the jointing leave much to be desired. Improvement in manufacture and the imposition of stringent chemical and mechanical tests are essential to ensure proper resistance to the stresses suffered under present conditions. In this connection the advantages of standardization as carried out by the British Engineering Standards Association will be recognized, and should be extended to include chemical tests.

7. Where any pipes are being renewed or relaid in ground which does not afford a solid foundation, steel pipes should be used.

8. Pipes for any purposes of 9 in. diameter or less should be laid at a minimum of 3 ft. from the surface of the road to the top of the pipe. For mains of larger diameter, a minimum of 5 ft. where practicable, but in no case less than 4 ft., should be insisted upon.

9. Electric high-tension mains should be laid at not less than 3 ft. 6 in. below the surface, and should be covered with some material sufficiently strong to prevent accidental penetration, such as strong cast-iron ducts or heavy metal plates.

10. Some provision, admittedly a problem of difficulty, for the adequate ventilation of the subsoil should be devised to compensate for the loss of ventilation due to the impervious nature of many road surfaces.

11. All underground subways should be efficiently ventilated into the external air and regularly patrolled.

12. Your Committee have considered the more general use of subways for pipes, and while satisfied that, when adequately ventilated and patrolled, they provide the safest and best method of preventing the dangers likely to arise to person and property from the causes enumerated in this report, they realize that the expense and dislocation of traffic thereby involved are such as to preclude any general scheme of subway construction. They recommend, however, that, in all cases of extensive street improvement and widening, such improvements should include the provision of a subway, which might have to be constructed piecemeal as the widening developed, and, further, that all underground services, with the possible exception of high-tension electric cables, but including low-tension cables, gas and water mains, post office telephones, and hydraulic power mains, should be laid in subways where these are available. In new arterial roads transverse subways should be constructed at important crossings or where likely to be required in future.

* Reference is made to this report in our editorial columns to-day.—ED. "G.J."

ASKERN "COALITE" WORKS.

First Section Completed.

Work is now completed on the first section of the new low-temperature carbonization plant at the pithead of the Askern Colliery, Yorkshire, and production is expected to begin in the course of the next few weeks. The plant has been erected for Doncaster Coalite, Ltd., by Low Temperature Carbonisation, Ltd., and we understand that arrangements have been made with the Askern Coal and Iron Company for the supply of coal direct from the pit over a period of years.

The plant is being erected in two parts, and the portion now completed will have an input of 250 tons of coal per day. The capacity will be doubled when the scheme is completed. The plant will be in continuous operation, day and night. The weekly output is expected to be: 1250 tons of "Coalite;" 35,000 galls. of coal oil; 4000 galls. of crude motor spirit; and 10 tons of sulphate of ammonia. In consequence of the widespread demand for smokeless fuel, it has been possible to embrace the Askern output in the contracts which have been arranged between Low Temperature Carbonisation, Ltd., and the coal merchants for the ensuing summer, and, as a consequence, the entire output of the works has been sold in advance right up to next winter.

The works at present consist of four batteries each containing 36 retorts, and, as at Barugh, the retorts are iron castings made of special quality iron of the normal Parker design. Each retort consists of a nest of pipes, which permit of equal heating throughout the charge. The pipes widen at the lower end to facilitate the discharge of the solidified fuel.

ROTARY DRIER.

An interesting feature of the scheme is the interposition of a rotary drier between the colliery washery and the retorts. The coal is tipped into the drier by means of a wagon tippler, which handles the 10-ton coal trucks that convey the coal slack from the pit washery. Waste heat from the retort flues is trapped and conducted by pipes to the drier. The drier has a capacity of 25 tons of coal per hour. After the coal has passed through the drier it is carried on a bucket elevator to storage bunkers, whence it is conveyed, as required, in travelling skips to the retorts. The period of carbonizing is four hours at 600° C. At the conclusion of the carbonizing period, the "Coalite" is discharged into cooling chambers, whence it is carried on a belt conveyor (consisting of high-quality, heat-resisting rubber canvas material) to the main bucket-conveyor, which delivers it to the rotary screen. The screen is mounted above the loading hoppers, and the "Coalite" is graded into four sizes and loaded direct into the railway trucks. Thus, the fuel is manufactured and delivered to the merchant or the consumer without manual handling after the coal has left the coal-face. The coal to be used is the well-known household quality sold by the Askern Coal and Iron Company, but of the smallest sizes, ranging from ⅜ in. down to dust. It has a very low ash content.

ELECTROSTATIC PRECIPITATION.

The gas handling plant represents a novel feature, in that the gas, instead of being subjected to direct condensation, undergoes a process of electrostatic precipitation, which throws down the oil without condensing the gas. The electrostatic precipitator consists of a tower having a number of suspended electrodes, which precipitate the oil from the "fog" released by the retorts. After the gas leaves the precipitator it is carried to the acid washer, where the ammonia is absorbed. The gas is afterwards cooled in a water-tube condenser, and the remaining light oils and moisture are condensed out. The gas is drawn from the batteries by means of two Bryan-Donkin steam driven exhausters, one working and one standing by. After leaving the exhauster, the gas is led into a "scrubber," where it is scrubbed with oil, and the crude spirit extracted. It then flows out of the scrubber and through an oil catcher, which arrests any entrained oil, and finally passes to the holder.

In accordance with economical practice for low-temperature works situated other than at a gas-works, the gas is used for heating the retorts and for general boiler-house purposes, the heat necessary for these purposes thus being supplied by one of the bye-products of carbonization. The motor spirit recovered in the scrubbing process is of very high quality, with pronounced anti-knock properties. The crude oils are subsequently distilled, and a further 10 p.ct. of spirit extracted, while other constituents are carbolic acid, cresylic acid, and pitch.

A modern tar oil distillation plant is at the present time being erected by Low Temperature Carbonisation, Ltd., at Barugh, in order to ensure the more profitable utilization of the oil products.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 17.

There is a fair amount of business being done in pitch for next season's shipment, and it is reported that 40s. per ton has been paid. The price is firm at not below that figure.

Creosote for export is unchanged at 6¾d. per gallon net f.o.b.

There is a considerable amount of inquiry for toluole for export, and the price is firm at 2s. 2d. per gallon naked at makers' works, for pure quality.

Pure benzole is steady at 1s. 11d. to 2s. per gallon. Solvent naphtha, 95/160, is quiet at 1s. 5d. to 1s. 6d. per gallon.

Pyridine is dull at 4s. per gallon.

Tar Products in the Provinces.

June 17.

The average prices of gas-works products during the week were: Gas-works tar, 18s. 9d. to 23s. 9d. Pitch—East Coast, 35s. to 35s. 6d. f.o.b. West Coast—Manchester, 29s. 6d. to 30s.; Liverpool, 31s. 6d. to 32s. 6d.; Clyde, 31s. 6d. to 32s. 6d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3¾d. to 1s. 4¼d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3¾d.; low gravity, 2¼d. to 2¾d.; Scotland, 3¼d. to 3¾d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. to 2s. 0½d., prompt. Naphthalene, £13 to £15. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.	s. d.	
Crude benzole	1 0 to	1 1	per gallon at works
Motor "	1 7 "	1 8	" " "
90 p.ct. "	1 9 "	1 10	" " "
Pure "	2 0 "	2 1	" " "

TRADE NOTES.

The "K" Oil Can.

We have received from Messrs. Joseph Kaye & Sons, Ltd., 93, High Holborn, W.C., one of their well-known seamless serrated steel oil cans. These cans are robust in construction, and are supplied to the British Navy and Army.

The Clean Coal Company, Ltd.

The Clean Coal Company, Ltd., of Southampton House, 317, High Holborn, W.C. 1, having found it necessary to enlarge their premises, have taken new offices, laboratories, and experimental works at Medway House, Horseferry Road, Westminster, S.W. 1 (Telephone: Victoria 6172 and 6173).

Cast-Iron Pipe Contracts for South America.

The Stanton Ironworks Company, Ltd., near Nottingham, have just succeeded in obtaining two important contracts for cast-iron pipes for delivery to South America—the one for some forty miles of pipe for the Monte Video Water Supply, and the other for ten miles for Rosario Water Supply, the pipes in both cases being chiefly in large diameters.

Carbonization in Vertical Retorts.

The Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., have published an attractive brochure dealing with their system of carbonization in vertical retorts. The publication is profusely illustrated, and explains the advantages of the system, its principles, description, and achievements, together with full details concerning the ancillary apparatus connected with Woodall-Duckham installations.

The Morris Overhead Runway.

Messrs. Herbert Morris, Ltd., of Loughborough, have published a most interesting booklet (No. 321), the subject of which is facts concerning their various types of overhead runways. There are countless uses to which the Morris runways can be put, and their simplicity of operation and ease of erection are two of their most commendable features. There is no need for a mechanical drawing; no discussion of ways and means with an expert; no experienced erection gang. Any practical man with a few hand tools can put it up.

Metropolitan-Vickers Electrical Company, Ltd.

With the expansion of Metropolitan-Vickers Electrical Company's Newcastle business, they have found it necessary to move into more commodious premises as from June 17, where much greater warehouse and office accommodation will be afforded. The Trade Counter will be open from 8 a.m. to 6 p.m., but, owing to the severity of the winter, the new showroom will not be complete until the end of August. The new address is Metro-Vick House, Northumberland Road, Newcastle-on-Tyne; and the telephone number, Central 6202/3/4/5.

Welded and Weldless Steel Tubes.

Messrs. Stewarts & Lloyds, Ltd., of Glasgow, have published the second section of their pocket catalogue, which deals with steel tubes for gas mains and distributing systems. Descriptions and illustrations are given of steel tubes and of fittings of all descriptions with spigot and socket joints for lead and yarn, with welded joints, "Albion" and "Stewarts" loose-flange joints, and "Victaulic" joints, together with tables of dimensions and weights. Price lists of the loose-flange joint and "Victaulic" joint tubes and fittings are also included.

Valves for Gas, Air, Liquor, &c.

The Bryan Donkin Company, Ltd., of Chesterfield, have published a beautifully illustrated catalogue of valves for low, medium, and high pressures of gas, &c. The popularity of the Company's valves is evidenced by the fact that during last year a total of over 10,000 were sold. Very careful attention is paid to the testing of all valves. Gas valves are tested hydraulically, and valves for high-pressure gas are, in addition to the hydraulic test, also tested by air pressure, the valves in sizes up to 12 in. being immersed in a tank of clear water. These valves are tested to suit customers' requirements.

Woodall-Duckham Installation for Bournemouth.

On the advice of their Engineer and Manager, Mr. P. G. G. Moon, the Bournemouth Gas and Water Company have placed an order with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for a further installation of continuous vertical retorts. The new plant will comprise one bench of 28 8o-in. retorts, and will have a daily carbonizing capacity of 203 tons of coal. The plant will be complete with coal and coke handling machinery and waste-heat boilers. This constitutes the sixth installation of Woodall-Duckham continuous verticals at Bournemouth.

"Hardy Simplex" Air Hammer Drills.

The Hardy Patent Pick Company, Ltd., of Sheffield, have published a booklet dealing with their "Hardy Simplex" hammer drills, particularly the special light-weight models for driving in hard ground. They have been designed to embody the advantages of easy handling and high boring speed in a machine of much lighter weight, thereby providing a real one-man machine for use in drives and for breast work generally in the very hardest rocks. The machine will drill holes from 6 ft. to 12 ft. deep easily, and they have been specially designed to meet the demand for air hammer drills with water injection, under pressure through the machine and drill steel, direct to the bottom of the hole being drilled.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

When all was going well with the market, it is unfortunate that the old bogey of shortage of tonnage should have reappeared. Exactly where the boats are cannot be said; but there is great difficulty at the moment in securing an adequate supply for all the coal that is needed, and some collieries are even threatened with idle time. As usual, this is having the effect of bringing old cargoes on the market at reduced figures when collieries are disappointed in expected boats, and must have a team in order to keep going. Apart from this, the strength of the market is maintained. Demand is good, and inquiry for forward business continues on quite a satisfactory scale. Deliveries due this month are in many cases being postponed owing to absence of suitable shipping arrangements, which is all helping to strengthen the forward position.

Current quotations are 17s. 6d. f.o.b. for Wear Special gas makes, and 16s. 6d. for bests. Seconds are 16s. to 16s. 3d. Durham coking is 16s. 6d. to 17s. Best Durham bunkers are round 17s., and seconds 16s. Best Northumberland screened steams are quoted at 15s. to 15s. 3d. Gas coke for shipment is firm at 22s. f.o.b.

YORKSHIRE AND LANCASHIRE.

Although the outlook is brighter, there is no material change in the working hours at the collieries. Supplies continue to be equal to the demand. There is an increased export demand, but not sufficient to make any great increase in prices. Quotations for best hards stand at 16s. 6d. per ton f.o.b. There is a shortage of good slacks. The house coal inquiry shows little change. Furnace coke production is fairly well cleared, and values remain about 20s. 6d. per ton f.o.b. The stronger demand for singles and smalls has made a slight increase in the prices. In the industrial section trade is more brisk, and values for prompt business are: Washed trebles, 16s. to 16s. 6d.; smalls, 13s. per ton. Gas coal is only in steady request.

The following are the Humber bunker and export prices (f.o.b. usual shipping ports):

South Yorkshire—Hards, Association, bunkers 19s. 9d., export 16s. 3d.; screened gas coal, export 16s. 6d. to 17s.; washed trebles, export 16s. to 16s. 6d.; washed doubles, bunkers 19s., export 15s. 9d. to 16s.; washed singles, export 14s. 9d. to 15s.; washed smalls, bunkers 15s. 9d. to 16s. 3d., export 13s. 6d.; rough slack, bunkers 13s. 6d. to 13s. 9d., export 11s. to 11s. 6d.; smithy peas, export 17s. to 18s.

West Yorkshire—Hartley's, f.o.b., bunkers 17s. 6d., export 15s. 6d. to 16s.; screened gas coal, export 16s. 9d. to 17s.; washed trebles, export 16s. to 16s. 6d.; washed doubles, export 15s.; washed singles, export 14s. 6d.; washed smalls, bunkers 15s. 3d., export 12s. 6d.; unwashed trebles, export 15s. 6d. to 16s.; unwashed doubles, export 13s. 6d. to 13s. 9d.; rough slack, bunkers 13s. 6d., export 10s.; coking smalls, export 10s.

Derbyshire and Nottinghamshire—Top Hards, bunkers 19s. 9d., export 16s. to 16s. 6d.; cobbles, bunkers, 18s. 9d. to 19s. 3d., export 15s. to 16s.; washed trebles, export 15s. 6d. to 16s.; washed doubles, export 15s. to 15s. 3d.; washed singles, bunkers 15s. 3d. to 15s. 9d., export 14s. 6d. to 15s.; washed smalls, export 12s. 6d. to 13s.; unwashed doubles, export 14s. 6d. to 15s.; rough slack, bunkers 13s. 9d. to 14s. 3d., export 10s. 6d. to 11s.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. to 18s., export 15s. to 16s.; gas coke, export 19s. 6d. to 21s. 6d.; furnace coke, export 20s. to 21s.; washed steam, Goole (West Yorkshire), bunkers, 18s.; Hull (West Yorkshire), bunkers 18s. 6d.; Hull (South Yorkshire), bunkers 18s. 9d., export 15s.

MIDLANDS.

Restriction of output is maintaining a fair balance between supply and demand in the principal departments of the market. At some of the pits more large coal is being raised than can readily be disposed of, and collieries would be better pleased if merchants were not so impassive with regard to stacking. Further inducements are offered to stimulate purchases in that direction. There is no formal revision of price lists; but terms applying to the house coal trade are very much a matter of negotiation.

Though the supply of coke is sufficient for present needs in this area, blast-furnacemen are anxious concerning the possibilities of increasing the output of pig iron. Furnaces recently re-started require more coke than has been released by cessation of the winter demand for central heating and other purposes, and expansion of output is retarded by economic considerations. Nevertheless, preparations are in hand for blowing-in more furnaces. Those collieries which possess coking plants are converting their slack up to the full extent of their current resources. At this season it is difficult to get supplies of slack from outside at a price which would pay for putting more ovens in commission. Furnace coke can still be bought round 14s. 6d. f.o.t.

CONTRACTS OPEN.

Coal.

The Sleaford Gas Company, Ltd., invite tenders for the supply of gas coal. [See advert. on p. 875.]

The Sutton in Ashfield Urban District Council invite tenders for the supply of gas coal. [See advert. on p. 875.]

Hydraulic Mains and Tar Towers.

The Gas Department of the Borough of Pontefract invite tenders for the renewal of hydraulic mains and tar towers. [See advert. on p. 875.]

Price Reduction at Blairgowrie.—The Directors of the Blairgowrie Gas Light Company have decided to reduce the price of gas by 6d. per 1000 c.ft., making the rate for ordinary consumption 6s. per 1000 c.ft., and for power purposes 5s. 3d.

South Shields Company's Offer.—The South Shields Gas Company have offered to lay mains and provide a gas service to the houses on the Hebburn Council's housing schemes, provided the Council agree to contribute £7 5s. per house towards the cost. This offer was considered at a meeting of the Hebburn Council on June 11, and no objection was raised to the laying of the service; but it was decided to inform the Gas Company that the Council was not in a position to contribute towards the cost.

Humber Oil from Coal Scheme.—Details of a scheme for the establishment of refineries on the banks of the Humber for the "cracking" of British coal oils and petroleum oils were given recently by Sir Arthur Grey Hazlerigg, Bart. "Here at Killingholme," he said, "we have a venture of great national importance. Low Temperature Carbonisation, Ltd., have a process that produces smokeless fuel and oil; Petroleum Refineries, Ltd., have a process that converts the oil produced by low-temperature carbonization into petrol and other bye-products. Together they offer a helping hand to that most vital and important national industry—coal."

James Keith and Blackman Company, Ltd.—In their report for the year ended March 31, the Directors state that the amount of business done during the year has exceeded that of the previous year. After providing for debenture interest, payment of preference dividend, and making sufficient allowance for depreciation and reserves against doubtful debts, the audited accounts show an available balance standing at the credit of the profit and loss account of £49,740. The Directors recommend the declaration of a dividend on the ordinary shares at the rate of 15 p.ct., *less* income-tax at 4s. in the £, absorbing £24,000; that the sum of £12,000 be transferred to reserve account; and that £13,740 be carried forward to the current year.

Weymouth Gas Company's Order.—This Order—see "JOURNAL," Vol. 185, p. 365—has now been granted, and gives the Company all they asked for. The "Southern Times and Dorset County Herald" for June 15 contains a lengthy reference to this, from which we quote the following: "The Order . . . invests the undertaking with heavy responsibilities, which the Directors and shareholders will shoulder with unbounded confidence in the eventual prosperity of their business, with its promise of early extensions. Progress is in the air. The times are in harmony with expansion and development. It is a good augury, with Weymouth shortly to extend her borders, that the great essential services of light, heat, and power should be preparing themselves and be fully equipped to meet the enormously increased demands of the near future. The Weymouth Consumers' Gas Company has envisaged such an inspiring prospect by successfully seeking Parliamentary powers to extend its manufacturing plant, and asserting its unchallengable right to compete in the friendliest way with any rival concern."

Gas v. Electricity at Nottingham.—Though the process cannot be regarded as being conducive to the public advantage, the proceedings at recent meetings of the Nottingham Corporation have indicated the perpetuation of a feeling of considerable acerbity upon the part of many who are responsible for the administration of the City's two chief municipal undertakings—gas and electricity. At the last assembly of the Council, the idea was propounded as to the necessity for the merging of the two responsible Committees into a single body, one of the suggestions underlying the proposal being that, as the purchase of coal forms in each case an indispensable necessity, more economical arrangements might possibly be effected by joint contracts. But the suggestion did not meet with any measure of general acceptance, the view entertained by Sir Albert Ball, the Chairman of the Gas Committee, that there is room for both undertakings, worked on independent lines for the general advantage of the City, meeting with favour. At the same time, it would be idle to attempt to deny that electricity supply is having a serious bearing upon the business of the Gas Department, as was evidenced by the Committee's recent annual report [see "JOURNAL" for May 15, p. 420]. Yet the gas undertaking continues to prove, as it has done for many years past, the City's most valuable municipal trading asset, without which the present high district rates must have been considerably increased.

Bolton Gas Committee's Report.—The Bolton Gas Committee, in their annual report and statement of accounts for the year ended March 31, state that the gross profit for the year is £56,803; £14,000 has been transferred to renewals fund, and £6419 has been allocated as revenue contribution to capital. A reduction in the price of gas and a fall in the residual market were responsible for a reduced income of £7360 and £16,920 respectively, a total of £24,280. It is pleasing to note, however, that an improvement in working costs has reduced the deficit on the year to £10,160. The capital expenditure during the year was £25,166, being part of the sum borrowed under the Bolton Corporation Act, 1925. The capital cost per 1000 c.ft. of gas sold now stands at 16s. 11¾d. In 1878, this figure was as high as 25s. 3d., while in 1927, it was at a minimum of 13s. 10½d. It may be pointed out that, with the present efficient plant at Gas Street working on full load, the capital figure would be even lower than this. The whole of the load during the current year has been carried by the Gas Street Works. The Lum Street plant has been shut down for repairs already much delayed owing to shortage of plant in previous years. Further repairs, more particularly to the carbonizing plant, are, however, still necessary before this station can be called upon to carry full load. The Committee have given careful consideration to a scheme for improving the condition of sulphate effluent, and have been able to enter into a contract which should considerably relieve the trouble experienced in treating the effluent at the Sewage Works. The cookery demonstrations and lectures which have been held from time to time have been very popular.

Cheaper Gas at Stratford.—The Stratford-on-Avon Town Council, at their monthly meeting, decided to reduce the price of gas by 2d. per 1000 c.ft., as from the end of the present quarter.

Primitiva Gas Company of Buenos Aires, Ltd.—In their report for the year 1928, which is to be presented to the shareholders at the annual general meeting on Tuesday next, the Directors recommend the payment of a dividend of 5 p.ct., *less* income-tax, leaving to be carried forward £56,605. The business of the Company has made good progress during the year.

Lisburn Gas Department Report.—The gross income of the Lisburn (Co. Antrim) Gas Department for the last financial year amounted to £21,044, as compared with £22,469 for the previous year, a reduction of £1424, against which is set off a reduction in expenditure of £1096; the balance, £328, representing a reduction of gross profits. The principal reductions on this account are reduction in cost of manufacture, £1204; gas rents, £500; and residuals sold, £786. The net profit shows a decrease of £451, accounted for by the reduction in gross profit. The amount outstanding in respect of loans advanced by the Ministry of Finance and on sundry mortgages is £50,259, as compared with £50,660.

Painter's Fatal Fall from Birmingham Gasholder.—At an inquest held recently by the Birmingham Coroner (Dr. Davison), a verdict of "Accidental death" was returned on John Mobbs (50), of 3, Darwin Street, who fell a distance of 135 ft. while working at the Washwood Heath Gasholder Station, Nechells. Evidence was given that Mobbs, who was described as an efficient workman, was engaged with other Corporation painters in painting the guide frame of a gasholder and was working at a height of 135 ft. He was moving tackle from one standard to another, and while walking along the girder he held on to the rope life-rail which had been fixed to the framework. A gust of wind caused him to lose his balance, and he fell to the ground. Death was instantaneous. Mobbs wore a life belt, but it was not attached to the life-rail.

Ashbourne Gas Profits.—The accounts of the Ashbourne (Derbyshire) gas undertaking for the year ended March 31 show a profit of £3500. Moving the adoption of the accounts at the Council Meeting, Mr. G. Rose said the profit was enough to pay the annual instalment, but, on the other hand, he was sorry to hear the prospects for the coming year were not so favourable. The gas undertaking had lost a good customer in the waterworks. The price of residuals was very bad, and the income from residuals looked like being a great deal less this year. The most serious blow of all was the new assessments on the gas-works. Unless there was a reduction of the assessments on appeal, there would be an increase of £600 in rates to be paid. Consequently it looked as if the gas-works would not make sufficient profit to meet the standing charges next year.

Meters, Ltd., Manchester.—In their report on the Company for the year ended March 31, the Directors of Meters, Ltd., Manchester, state that, after providing for interest on debenture stock (*less* tax), general management expenses, directors' fees, legal charges, expenses on patents, income-tax, repairs and renewals, depreciation upon buildings, machinery, and plant, &c., the net profit amounts to £21,319, which, added to the balance of £4489 brought forward, gives a total of £25,808. After deducting the interim dividends amounting to £6885 paid in November last, the amount now available for appropriation is £18,923. The Directors recommend (*a*) the payment of final dividends for the year ended March 31, 1929, of 2¾ p.ct. (actual) upon the preference shares, and of 6½ p.ct. (actual) upon the ordinary shares, making the total dividends for the year 5½ p.ct. upon the preference shares and 9 p.ct. upon the ordinary shares (both *less* income-tax); and (*b*) that the balance of £5341 be carried forward to next year's accounts.

Plymouth Gas Company.—The report to be presented at the annual meeting by the Directors of the Plymouth and Stonehouse Gas Light and Coke Company shows that there is a balance standing to the credit of profit and loss accounts of £30,282, and the Directors recommend the payment therefrom of a dividend for the half-year to March 31 last at the rate of 8 p.ct. per annum on the ordinary stock, 13s. 6d. per share on the additional shares, and 13s. per share on the new shares, Act 1879, *less* income-tax. These payments will absorb £16,881, leaving £13,400 to be carried to the credit of the next account. The report further states that as from Michaelmas last the price of gas was reduced from 6½d. to 6d. per therm. Gas sold during the year shows a gratifying increase of nearly 5 p.ct. over the previous year, and the demand for gas consuming appliances continues to be highly satisfactory. The capital account discloses that £11,273 was expended on new buildings and plant during the year, and £2583 on new mains and service pipes, &c., while the revenue account shows that in addition to the amounts expended for the manufacture and distribution of gas, management, &c., £7282 was paid into the superannuation fund, and that the co-partners' share of profit was £8272.

The Barnoldswick Gas Department gained a second prize by their entry in the class for tradesmen's horse-drawn exhibits at the local Ambulance Corps annual gala recently.

The Bradford Gas Committee have given permission for the Gas Department to take part in a Cooking and Food Exhibition, which is to be held in Bradford from Sept. 24 to Oct. 5.

A gas explosion occurred on June 12 at the Atlas Works, Liddle Street, Gateshead, causing injuries to a workman named John Kinnaird. Returning from lunch, Kinnaird found that the gas jets beneath the stoving ovens had gone out, and he struck a match to relight them. Immediately there was a violent explosion. It is not known how the gas jets came to be out, but it is supposed that they were blown out by the wind.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. June 14.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb. 7	5	5	Aldershot 5 p.c. max. C.	70—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	72—75	..	72—73
1,551,868	,,	Apl. 11	7⅞	7⅞	Alliance & Dublin Ord.	96—99	..	96½—98
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	64—67	..	..
522,655	,,	Mar. 7	7	7	Barnet Ord. 7 p.c.	115—118	+1	116½—117
800,000	1	May 9	1/4½	1/4½	Bombay, Ltd.	19/—21/-	—1/-	19/9
172,500	10	Mar. 7	8½	9	Bournemouth 5 p.c.	13—13½	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12⅝—12⅞	..	..
439,160	10	,,	6	6	Do. Pref. 6 p.c.	10⅝—11½	..	..
50,000	Stk.	Jan. 10	3	3	Do. 3 p.c. Deb.	55—58	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
857,900	,,	Mar. 21	7½	7½	Brighton & Hove 6 p.c. Con.	113—116	..	115—115½
371,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	99—102	..	100½—102
1,267,500	,,	Feb. 21	5	5	Bristol 5 p.c. max.	89½—90½a	..	..
855,000	,,	Apl. 11	8	7½	British Ord.	117—120	+1	117—119½
100,000	,,	Dec. 20	7	7	Do. 7 p.c. Pref.	115—120	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	73—76	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	94—97	..	96½—96½
100,000	10	May 30	8	8	Cape Town, Ltd.	8½—9½	+⅛	..
100,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	..
150,000	Stk.	Dec. 20	4½	4½	Do. 4½ p.c. Deb.	75—78	..	75
696,860	,,	Feb. 21	6	6	Cardiff Con. Ord.	97—100	..	..
287,840	,,	Jan. 10	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
157,150	,,	Feb. 21	5	6½	Chester 5 p.c. Ord.	88—93b	..	..
98,936	1	May 9	1/2/-	1/2/-	Colombo Ltd. Ord.	35/—37/-	..	..
24,495	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	20/—22/-	..	..
875,402	1	Apl. 11	1/9⅜	1/9⅜	Colonial Gas Assn. Ld. Ord.	24/6—26/6	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/6—22/6	..	..
2,073,280	Stk.	Feb. 21	5	7	Commercial Ord.	97—100	..	97½—98
475,000	,,	June 13	8	8	Do. 8 p.c. Deb.	56—59*	..	56½
787,550	,,	Feb. 21	7	7	Croydon sliding scale	111—114	..	111½—114
493,100	,,	,,	5	5	Do. max. div.	83—86	..	84—84½
542,270	,,	Mar. 7	7	10	Derby Con.	112—117e	..	..
55,000	,,	Dec. 20	4	4	Do. Deb.	70—72e	..	..
909,000	,,	Mar. 7	5	5	East Hull Ord. 5 p.c.	73—75	..	..
1,003,180	10	Mar. 21	†4	†7	European, Ltd.	17—19	+⅛	17½—17⅝
19,708,480	Stk.	Feb. 21	5½	5½	Gas Light & Coke 4 p.c. Ord.	19/7½—20/1½f	+·/4½	19/4½—20/3
2,690,000	,,	,,	3½	3½	Do. 3½ p.c. max.	63—65	..	62½—64
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76—78	..	77½—78
5,639,620	,,	June 13	3	3	Do. 3 p.c. Con. Deb.	58—61*	—1	61
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	97—100*	—2	100—101½
93,500	,,	Mar. 21	7	7	Hastings & St L. 5 p.c. Conv	98—103	..	..
248,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	80—85	..	..
70,000	10	Apl. 24	†10	†10	Hongkong & China, Ltd.	14—15	..	..
218,200	Stk.	Mar. 7	5½	6	Hornsey Con. 3½ p.c.	86—89	..	87
1,978,000	,,	May 30	10	20	Imperial Continental Gas.	430—450	—10	431—448
228,180	,,	Feb. 7	8½	8½	Do. 3½ p.c. Red. Deb.	70—73	..	..
295,242	,,	Mar. 7	7½	8	Lea Bridge 5 p.c. Ord.	117—120	..	..
2,145,907	,,	Feb. 21	6½	6½	Liverpool 5 p.c. Ord.	95—96b	..	..
600,000	,,	Mar. 21	7	7	Do. 7 p.c. Red. Pref.	102—104b	..	..
165,736	,,	Feb. 21	9	8	Maidstone 5 p.c. Cap.	124—129	..	..
63,480	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	54—57	..	..
75,000	5	June 13	†8	†10	Malta & Mediterranean	5½—6*	—½	..
392,000	—	Apl. 2	—	5½	Metrop'n (of Melbourne) 5½ p.c. Red. Deb.	100—102	..	..
841,920	Stk.	May 30	†5	†9	Montevideo, Ltd.	102—105*	..	..
2,031,315	,,	Feb. 21	5	5⅔	Newcastle & Gateshead Con.	17/3—17/9d/	+·/4½	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref.	74½—75½d	..	..
491,705	,,	Dec. 20	8½	8½	Do. 8½ p.c. Deb.	69½—70½d	..	..
131,780	,,	Mar. 7	7/1/0	7/1/0	North Middlesex 6 p.c. Con.	105—110	..	..
900,000	,,	Apl. 24	9	7	Oriental, Ltd.	115—120	..	..
205,162	,,	Dec. 20	7½	8	Plym'th & Ston'house 5 p.c.	112—115	..	..
424,416	,,	Feb. 21	7½	8⅛	Portsm'th Con. Stk. 4p.c. Std.	118—119	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max.	82—85	..	..
2,534,464	1	—	—	—	Primitiva Ord.	37/9—39/6	+·/6	37/3—39/9
244,500	100	June 8	4	4	Do. 4 p.c. Red. Deb.	92—95*	..	..
695,000	Stk.	Jan. 24	4	4	Do. 4 p.c. Red. Deb. 1911	79—82	..	80½—81
416,845	,,	Dec. 20	4	4	Do. 4 p.c. Cons. Deb.	79—82	..	79½
150,000	10	Mar. 21	6	6	San Paulo 6 p.c. Pref.	8½—9	..	..
1,736,968	Stk.	Mar. 21	6½	6⅔	Sheffield Cons.	109—111e	..	..
95,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	74—77e	..	..
90,000	10	June 13	†4	†4	South African	4—6*	..	..
6,609,895	Stk.	Feb. 21	5	7½	South Met. Ord.	104—106	..	104½—105⅝
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	108—111	..	108—109
1,895,445	,,	Jan. 10	3	3	Do. 3 p.c. Deb.	59—61	..	59½
784,000	,,	Mar. 7	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	..
91,500	,,	Mar. 7	8½	8½	South Shields Con.	106½—107½d	..	..
1,548,795	,,	Feb. 21	6½	6½	South Suburban Ord. 6 p.c.	107—110	..	107½—108⅝
468,837	,,	Dec. 20	5	5	Do. 5 p.c. Deb.	97—100	..	..
847,740	,,	Mar. 7	5	6	South'mpton Ord. 5 p.c. max.	77—80	..	..
121,275	,,	Dec. 20	4	4	Do. 4 p.c. Deb.	72—75	..	..
179,014	,,	Feb. 21	8	8	Sutton Ord.	116—119	..	..
350,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	Dec. 20	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	+2	..
1,002,275	,,	Mar. 7	—	6½	Tottenham District Ord.	106—109	..	107
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
161,258	,,	June 13	4	4	Do. 4 p.c. Deb.	74—77*	—1	76
239,094	,,	Mar. 7	5⅞	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98	..	96—97
88,280	,,	,,	5	5	Do. 5 p.c. pref.	88—93	..	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	,,	Feb. 21	8½	9	Wandsworth A 5 p.c.	147—152	..	..
355,686	,,	,,	7½	7½	Do. B 5½ p.c.	125—130	..	..
432,585	,,	,,	6⅔	6⅔	Do. C and New	102—107	..	..
552,000	,,	,,	6½	7½	Do. Wimbledon 5 p.c.	115—120	..	117—118
98,000	,,	,,	7⅛	7⅛	Do. Epsom 5 p.c.	126—131	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	90—95	..	..
88,416	,,	Dec. 20	8	8	Do. 8 p.c. Deb.	56—59	..	..
184,748	,,	,,	4	4	Do. 4 p.c. Deb.	77—80	..	..
207,500	,,	,,	5	5	Do. 5 p.c. Deb.	97—100	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. f.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.
§ % p.a. for 9 months to March 31, 1929.

STOCK ISSUE.

By Order of the Directors.
NEW ISSUE OF PERPETUAL DEBENTURE STOCK.

THE EAST HULL GAS COMPANY.
(Incorporated 1867.)

Messrs. A. & W. RICHARDS
are Instructed to OFFER FOR SALE BY TENDER
£64,000
5½ PER CENT. PERPETUAL DEBENTURE STOCK.
Minimum Price of Issue, Par.

Prospectus and Form of Tender (which latter must be sent in by 11 o'clock on Thursday, 4th July) may be obtained of A. & W. RICHARDS, 37, WALBROOK, E.C. 4.

COMPANY NOTICES.

THE GAS LIGHT AND COKE COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS of this Company, SO FAR AS THEY RELATE TO CAPITAL STOCKS, WILL BE CLOSED at 4 o'clock p.m. on Monday, the 1st day of July next, and will be RE-OPENED on the morning of Thursday, the 1st day of August next.

Dividends payable in respect of the Half-Year ending the 30th inst. will be remitted by Warrant forwarded by post on the 31st of August, 1929, to those Proprietors who were the Holders of Capital Stocks when the Transfer Books were closed, or their Authorized Agents.

By order,
WILLIAM LYLE GALBRAITH,
Secretary.

Chief Office:
Horseferry Road,
Westminster, S.W. 1,
June 15, 1929.

CASES

IN

Green Grain Cloth, Gilt-Lettered,

FOR

BINDING

"The Gas Salesman"

Price **2/6** each.

Subscribers' Copies of "THE GAS SALESMAN," bound in above, at

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Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

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(See also advertisement Centre p. IX.)
Telephone: VICTORIA 2417. Telegrams: "EVAPORATOR PHONE LONDON."

GEORGE WILSON GAS METERS, Ltd.
for
GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS
Foleshill Road, COVENTRY.
Telephone: 596. Telegrams: "GASMETER."
Certus Works, Kingston Road, Raynes Park, LONDON, S.W. 20.
Radium Works, 12, Radium Street, Oldham Road, MANCHESTER.
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SULPHURIC ACID.
SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
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Telegrams—"HYDROCHLORIC, FEN LONDON."
Telephone—ROYAL 1166.

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FOR Motor Lorries and Railway Traffic can be seen erected at our Works READY FOR DELIVERY. Inspection by your Engineer invited and a test by your Local Inspector of Weights and Measures before delivery. Every machine a High-Class Engineering Product and fully guaranteed.
CHARLES ROSS, LIMITED, SHEFFIELD.

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Tins for Sale to Consumers.
In Bulk for Works Use.
(See "Gas Salesman," p. 132.)
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IMMEDIATE ACTIVITY.
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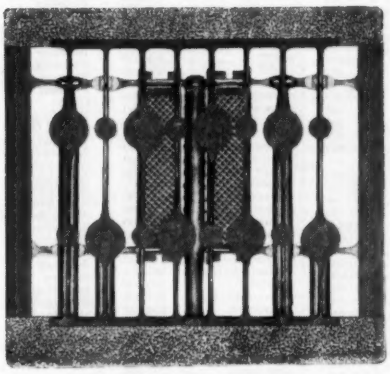
NEW WORLD
COOKER
WITH "DISC-BAR" HOTPLATE



THE "DISC-BARS"

Metal discs which are integral with the hotplate bars provide a firm rest for the smallest of cooking vessels. "Disc-Bars" in conjunction with "Rado" burners ensure complete combustion of the gas—an essential consideration from the point of view of hygiene and economy.

NEW "VERTICO" TAPS

"Disc-Bar" Hotplates are fitted with new patent "Vertico" taps with which sleeves, discs, or other similar device for controlling the air supply to the burners are now, for the first time, rendered unnecessary. Inside the body of each "Vertico" tap is embodied a pressure adjustment. This, combined with the calorific value adjustment, ensures that all hotplate burners can be adjusted to give the required consumption of gas with correct flame aeration, under all conditions, and avoids any risk of the air adjustment being altered when the burners are taken out for cleaning.

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RICHMONDS GAS STOVE COMPANY, Ltd., WARRINGTON & LONDON

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	Cu. Ft. Daily
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Abertillery	500,000
Abertillery	100,000
Admiralty:	
British	800,000
British	800,000
British	800,000
British	800,000
British	800,000
French	800,000
French	800,000
Agram	200,000
Airdrie	43,000
Aldershot	1,400,000
Aldershot	1,000,000
Aldershot	1,316,000
Algiers	1,760,000
Alkmaar	400,000
Allenstein	200,000
Alost	700,000
Amersfoort	300,000
Amsterdam	1,000,000
Amsterdam	1,000,000
Amsterdam	2,700,000
Amsterdam	1,350,000
Antwerp	1,500,000
Antwerp	1,000,000
Antwerp	1,500,000
Antwerp	1,900,000
Arundel	215,000
Ascot	423,000
Ashford	250,000
Asnières	650,000
Augsburg	425,000
Aylesbury	150,000
Aylesbury	470,000
Banbury	200,000
Banff	125,000
Barnsley	588,000
Barrow	300,000
Barrow	500,000
Barry	500,000
Barry	720,000
Bath	1,000,000
Bath	1,000,000
Bath	1,300,000
Bath	1,200,000
Belfast	1,700,000
Belfast	4,500,000
Belfast	1,250,000
Belfast	1,250,000
Belfast	2,250,000
Benrath	125,000
Berkhampstead	259,000
Berlin:	
Charlottenb'g	2,500,000
Danziger Str.	1,000,000
Neukoelln	650,000
Neukoelln	700,000
Schmargendorf	760,000
Tegel	3,500,000
Tegel	6,350,000
Tegel	245,000
Berne, Switz.	725,000
Boxhill	400,000
Bideford	258,000
Bilston	375,000
Bilston	125,000
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Adderley St.	675,000
Nechells	3,000,000
Nechells	3,000,000
Nechells	3,000,000
Swan Village	1,500,000
Windsor St.	3,000,000
Windsor St.	3,000,000
Bishop's Stortford	200,000
Bishop's Stortford	300,000
Bishop's Stortford	200,000
Blackburn	1,190,000
Blantyre	150,000
Blois	125,000
Blois	125,000
Bochum	530,000
Bognor	100,000
Bognor	423,000
Bognor	500,000
Bo ness	125,000
Boulogne	340,000
Bournemouth	1,000,000
Bournemouth	500,000
Bournemouth	1,500,000
Bournemouth	1,000,000
Bournemouth	500,000
Bournemouth	1,530,000
Bournemouth	2,000,000
Bournemouth	580,000
Bournemouth	2,750,000
Bremen	550,000
Bremen	950,000
Bremen	850,000
Brentwood	250,000
Brescia	588,000
Brescia	588,000
Brest	550,000
Bridgwater	200,000
Bridlington	150,000
Bridlington	200,000
Bridlington	550,000
Brieg	100,000
Brierley Hill	250,000
Brighton	1,750,000
Brighton	1,850,000
Brighton	750,000
Brighton	2,750,000
Brighton	3,000,000
Bristol	2,000,000
Bristol	2,500,000
Bristol	825,000
Bristol	825,000
Bromley	1,500,000
Bruges	200,000
Bruges	600,000
Brussels:	
Anderlecht	350,000
Anderlecht	350,000
Forest	1,000,000
Forest	1,000,000
Forest	1,000,000
Forest	1,500,000
Forest	88,000
Koekelberg	1,000,000
St. Gilles	1,000,000
St. Josse	1,000,000
St. Josse	600,000
St. Josse	775,000
Ville	750,000
Ville	750,000
Ville	1,500,000
Ville	350,000
Bucarest	1,100,000
Buckie	164,000
Budapest	50,000
Budapest	1,750,000
Budapest	200,000
Budapest	250,000
Caen	250,000
Cambridge	500,000
Cambridge	1,000,000
Cambridge	1,700,000
Cardiff	2,000,000
Cardiff	3,000,000
Cardiff	1,950,000
Cardiff	600,000
Carlisle	600,000
Carlsruhe	500,000
Carnarvon	248,000
Charleroi	1,250,000
Châteauroux	125,000
Châteauroux	125,000
Châtelet	500,000
Chester	564,000
Chesterfield	430,000
Chesterfield	90,000
Chesterton	197,000
Chichester	250,000
Chorley	300,000
Cie. des Compteurs	1,150,000
Cie. Lorraine de Ch.	210,000
Cie. Mines de Roche	585,000
Coatbridge	400,000
Commercial, L'n	850,000
Commercial	850,000
Commercial	1,250,000
Commercial	2,000,000
Commercial	800,000
Commercial	2,100,000
Copenhagen	700,000
Copenhagen	2,300,000
Copenhagen	1,750,000
Copenhagen	1,200,000
Courtrai	250,000
Coventry	600,000
Coventry	600,000
Coventry	800,000
Coventry	1,250,000
Coventry	350,000
Cowdenbeath	420,000
Crascow	200,000
Crascow	200,000
Cranleigh	188,000
Crefeld	500,000
Crewe	700,000
Crewe	800,000
Crosfield & Sons	1,500,000
Crosfield & Sons	1,500,000
Crowborough	150,000
Croydon	1,250,000
Croydon	625,000
Croydon	625,000
Croydon	550,000
Croydon	650,000
Croydon	1,125,000
Croydon	150,000
Croydon	3,000,000
Croydon	6,000,000
Deal	250,000
Deal	250,000
Debreczin	100,000
Derby	1,500,000
Derby	2,000,000
Deventer	150,000
Deventer	200,000
Devonport	1,600,000
Devonport	1,100,000
Doncaster	1,350,000
Dorking	150,000
Dorking	300,000
Dorking	130,000
Dover	500,000
Dublin	2,000,000
Dublin	2,000,000
Dublin	650,000
Dudley	800,000
Dundee	1,500,000
Dundee	1,650,000
Dunedin, N.Z.	150,000
Dunedin	275,000
Durham	200,000
Dusseldorf	1,000,000
Eastbourne	1,250,000
Eastbourne	1,550,000
Edinburgh	2,000,000
Eindhoven	1,500,000
Enschede	282,000
Epping	500,000
Epsom	225,000
Epsom	300,000
Esen	1,400,000
Esen-Borbeck	1,400,000
Exeter	1,100,000
Exeter	1,200,000
Exmouth	376,000
Falmouth	150,000
Falmouth	200,000
Faversham	200,000
Flensburg	300,000
Flensburg	125,000
Forst	300,000
Frankenthal	175,000
Fuel Research Wks.	500,000
Fuel Research Wks.	500,000
Furnes	500,000
Gablonz	140,000
Gas L. & C. Co.:	
Beckton	10,000,000
Beckton	7,000,000
Beckton	3,500,000
Beckton	7,000,000
Beckton	7,000,000
Beckton	5,250,000
Beckton	4,500,000
Beckton	3,000,000
Beckton	1,500,000
Bow Common	1,000,000
Bow Common	1,150,000
Bow Common	150,000
Brentford	1,200,000
Brentford	850,000
Brentford	350,000
Brentford	750,000
Bromley	3,750,000
Bromley	2,250,000
Bromley	1,000,000
Bromley	1,000,000
Bromley	1,000,000
Bromley	1,450,000
Bromley	1,350,000
Fulham	2,500,000
Fulham	1,700,000
Ilford	650,000
Ilford	750,000
Kensal Green	2,250,000
Kensal Green	2,250,000
Kensal Green	2,250,000
Nine Elms	2,750,000
Nine Elms	750,000
Nine Elms	1,870,000
Nine Elms	2,850,000
Shoreditch	900,000
Shoreditch	2,700,000
Shoreditch	2,725,000
Southall	2,000,000
Southall	3,000,000
Staines	600,000
Stratford	1,700,000
Stratford	850,000
Stratford	2,350,000
Stratford	2,350,000
Gelsenkirchen	175,000
Gelsenkirchen	350,000
Geneva	500,000
Geneva	700,000
Geneva	1,270,000
Gennevilliers	10,600,000
Gennevilliers	2,900,000
Girvan	235,000
Glasgow	3,000,000
Glasgow	2,500,000
Glasgow	2,250,000
Glossop	340,000
Gloucester	800,000
Gloucester	1,000,000
Gosport	200,000
Gosport	225,000
Göteborg	300,000
Göteborg	600,000
Graudenz	200,000
Grays	250,000
Grays	400,000
Grays	725,000
Groningen, Holland	500,000
Guest Keen & Piggotts, Ltd.	1,936,000
Guildford	300,000
Guildford	300,000
Guildford	350,000
Guildford	1,100,000
Guildford	150,000
Haarlem	850,000
Hamburg	1,750,000
Hampton Court	500,000
Hampton Court	600,000
Hampton Court	1,100,000
Hanley	800,000
Hanley	800,000
Hartlepool	750,000
Hartlepool	765,000
Hastings	1,250,000
Haywards Heath	470,000
Hebden Bridge	300,000
Heidelberg	200,000
Hereford	525,000
Hertford	197,000
Hertford	244,000
Hessle	150,000
Heywood	300,000
High Wycombe	752,000
Hilversum	850,000
Hinckley	250,000
Holyhead	197,000
Hong Kong	450,000
Hong Kong	450,000
Hornsey	1,000,000
Hornsey	1,000,000
Hornsey	750,000
Hornsey	750,000
Horsham	235,000
Hull	1,500,000
Hull	1,000,000
Hull	1,600,000
Innsbruck	200,000
Ipswich	750,000
Ipswich	1,250,000
Ipswich	600,000
Jersey	564,000
Jersey	564,000
Kampen	350,000
Karlsbad	350,000
Kendal	329,000
Kidsgrove	235,000
Kiel	1,000,000
Kiel	880,000
Kilmarnock	500,000
Kilmarnock	585,000
King's Lynn	197,000
King's Lynn	400,000
Kirkintilloch	360,000
Kirkintilloch	827,000
Kolozvar	100,000
Lancaster	500,000
Langley Mill	500,000
Largs	235,000
Lausanne	250,000
Lausanne	385,000
Le Mans	420,000
Lea Bridge	350,000
Lea Bridge	350,000
Lea Bridge	400,000
Lea Bridge	1,000,000
Lea Bridge	1,500,000
Lea Bridge	1,530,000
Leamington	600,000
Leamington	525,000
Leatherhead	705,000
Leeds	1,500,000
Leeuwarden	400,000
Leiden	500,000
Leiden	575,000
Leigh	350,000
Lemberg	360,000
Lemberg	500,000
Letchworth	362,000
Letchworth	423,000
Liége	1,000,000
Liége	750,000
Lille	860,000
Lincoln	500,000
Lincoln	893,000
Liverpool	3,500,000
Liverpool	4,500,000
Liverpool	750,000
Liverpool	1,750,000
Liverpool	1,250,000
Liverpool	3,000,000
Liverpool	1,500,000
Liverpool	1,250,000
Liverpool	2,350,000
Long Eaton	430,000
Long Eaton	170,000
Longton	600,000
Louvain	800,000
Lubeck	400,000
Luton	400,000
Maastricht	200,000
Macclesfield	800,000
Magdeburg	1,400,000
Maidenhead	225,000
Maidenhead	225,000
Maidenhead	175,000
Maidenhead	175,000
Maidenhead	200,000
Maidenhead	200,000
Maidstone	500,000
Maidstone	500,000
Malines	575,000
Malines	350,000
Malmö	400,000
Malta	3,500,000
Manchester	3,500,000
Manchester	1,500,000
Manchester	330,000
Mansfield	403,000
Manisield	100,000
Marlborough	700,000
Mayence	5,000,000
Melbourne	300,000
Merthyr Tydfil	200,000
Merthyr Tydfil	1,250,000
Middlesbrough	750,000
Middlesbrough	900,000
Middlesbrough	9,000,000
M.M. Woolston	275,000
Monaco	618,000
Monaco	618,000
Monaco	500,000
Mons	1,222,000
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Munich	175,000
Namur	350,000
Narbonne	400,000
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Nelson	140,000
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N. Middlesex	200,000
N. Middlesex	75,000
N. Middlesex	650,000
N. Middlesex	650,000
N. Middlesex	1,000,000
Northfleet	235,000
North Sydney	500,000
North Sydney	500,000
Norwich	1,000,000
Norwich	300,000
Norwich	500,000
Norwich	1,500,000
Nottingham	1,000,000
Nottingham	1,000,000
Nuneaton	125,000
Oberhausen	175,000
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Oldenburg	200,000
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Ostend	100,000
Ostend	200,000
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Palermo	850,000
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Clichy	4,000,000
Ivry	1,570,000
Landy	6,000,000
Landy	6,000,000
Landy	5,295,000
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La Villette	2,000,000
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Portsmouth	2,000,000
Portsmouth	800,000
Portsmouth	2,000,000
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Posen	700,000
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Romford	350,000
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Rotterdam	750,000
Rotterdam	750,000
Rotterdam	600,000
Rotterdam	2,000,000
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Scarborough	1,350,000
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Shanghai	225,000
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Southampton	600,000
Southampton	100,000
Southampton	1,000,000
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Southend	900,000
Southgate	400,000
Southgate	500,000
Southgate	800,000
Southgate	500,000
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Southport	900,000
Southport	450,000
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Stirling	970,000
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Stockholm	1,750,000
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Stockport	600,000
Stockport	400,000
Stockport	400,000
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Stourbridge	500,000
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Swansea	450,000
Swansea	1,250,000
Swansea	2,000,000
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Swindon	450,000
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Tottenham	750,000
Tottenham	350,000
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Tottenham	500,000
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Winchester	410,000
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Wolverhampton	1,000,000
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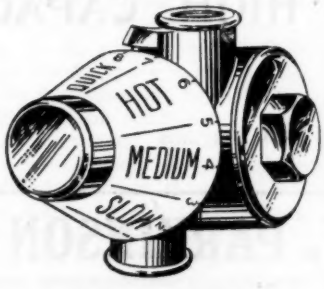

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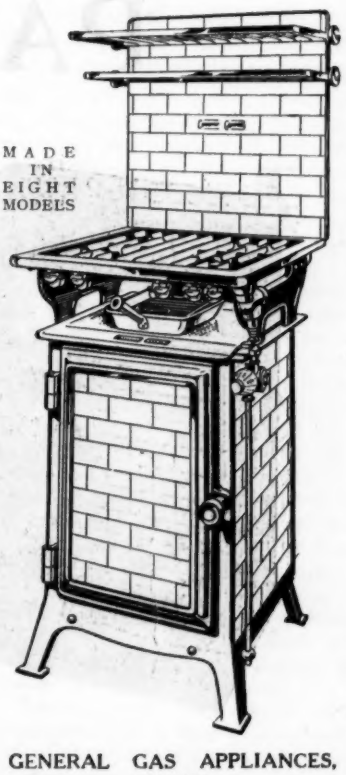

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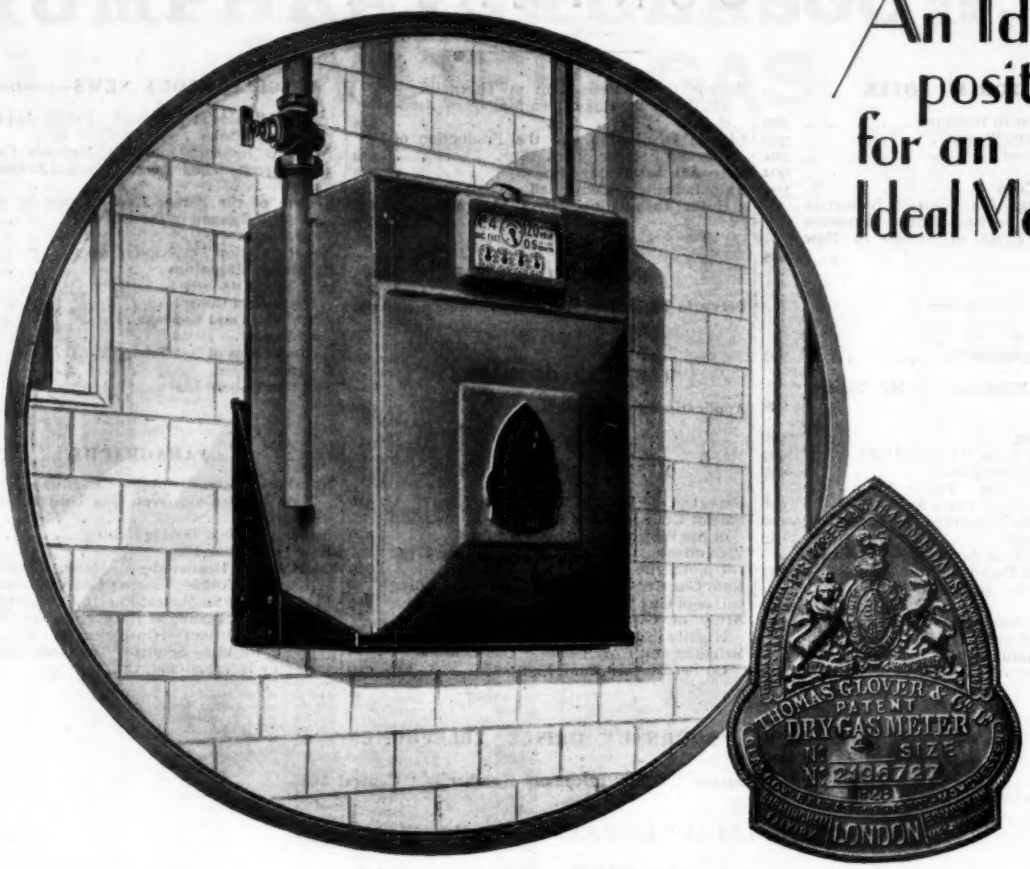

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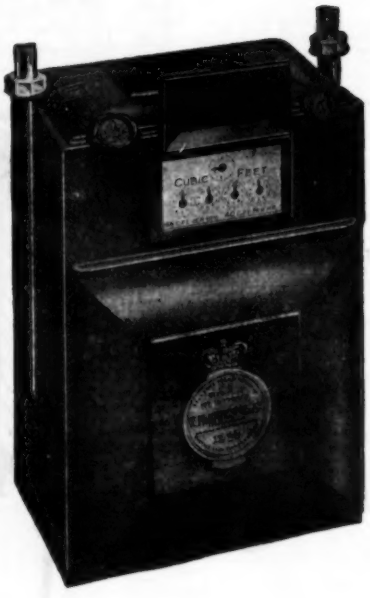

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